THE FOUNDRY

VOL. 12. DETROIT, MICH., AUGUST, 1898. No. 72.

Necessity of Well Mixed Furnace Casts and Correct Pig Iron Analysis.*

BY THOS. D. WEST.

The recent advance in founding, causing us to realize that the grain of pig metal is not a reliable index to its grade, has opened a door to such results, through the occasional indifference and error of those using analyses in shipping iron, as may cause more contention than ever between maker and buyer and often heavy losses to both. A few years back every furnace had its "graders" whose special business it was to

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direct the separating of casts of iron into different piles, according to the grain of the pig metal. The most open pigs went into piles as No. 1 iron; the smaller-grained as No. 2, 3 or 4, according as the grain decreased in size. The greatest care was exercised in thus grading iron, not only because all believed that the size of the grain revealed the grade, but also because the "grader" had a reputation to sustain, in making his various piles of even grain and the furnaceman was anxious to have every pig of the open iron collected by itself, for a No. 1 iron brought him more money than a No. 2.

With the advent of selling by chemical analyses, all this was changed. The graders were replaced by the chemists and the iron as it came from a "cast" is now thrown into one pile, and neither furnacemen nor progressive founders, as a rule, pay any attention to the size of the grain in pig metal. Yet, entire reliance upon analyses sometimes leaves the purchaser, it might be said, in the position of the man buying a "pig in a poke," because the reported analyses may belie the real composition of the iron. Because of this fact, any indifference or error on the part of the shipper, might cause grievous injury as well as losses to the trade of both furnaceman and founder, especially to founders who do not employ chemists to check up their furnace analyses. It is not the purpose of this paper to indicate in detail how errors in reported analyses can be made. Furnacemen know this themselves. The main object is to urge that furnacemen use every precaution to have reported analyses as nearly correct as it is possible to have them, and to have the various "casts" at the furnace well mixed. It should not be inferred from what is said above that all furnacemen are indifferent to their analyses reports. Some are striving earnestly to avoid mistakes in this particular. But I can say, that our firm has had such losses from want of care on the part of some furnaces, in the matter of reporting analyses, that we will not wholly depend any more on furnace analyses. We now have our own chemist, who "checks" every car of iron that comes into our yard. Since we have adopted this measure, it is rare (providing a car or cast of iron is fairly uniform), that we vary .10 in silicon or are seriously off in the sulphur desired in our product. Before we had our own chemist we were as liable to be .75 off in silicon or .04 in sulphur as we were to obtain the desired results, let the car of iron be ever so well mixed or uniform in grade.

*Paper read at the Cincinnati meeting (June, 1898), of the American Foundrymen's Association.

I am well aware that furnacemen could reply to this paper by citing cases wherein failure to obtain desired results was due more to the ignorance of the founder than to the errors on the part of the iron shippers. This I do not deny; but there should be an end of tolerating such ignorance on the part of the founder. As the buyer, he should tell what he wants as is the practice in purchasing most stable trade articles. If a founder is unable to specify for himself what class of iron he should have, or the combinantion of elements necessary to give him desired physical results in his casting, he should suffer his own losses, till he learns. There is no excuse at this day for his not knowing all this, at least, as much as he has any right to expect of the furnaceman. It is not just that a furnaceman should assume the responsibility of what a founder may obtain from a mixture of his iron, for the founder can readily nullify the value of analyses, or the results to be obtained from pig metal in mixture by itself, by the use of scrap or by variations in fuel and methods of charging. All that should be expected of the furnaceman is a well mixed "cast" with a correct analyses of the iron. But to secure this, much reformatory work is yet to be done. The aim should be to discover, if possible, what factors are constant, impractical of change, and those that are influenced by judgment or care of the operator. There are many chances to make errors in the analysis cards of iron from the time it leaves the casting house until it reaches the cars ready for shipment. Such work may have to pass through the hands of four or more men by whose carelessness the reported analyses may be badly distorted from that found by the chemist. My reasons for arguing every founder to employ his own chemist are two-fold. In the first place, this plan better insures desired results from mixtures; in the second place, the control of operations by analyses, would soon be so perfect that foundrymen unaccustomed to employing it, would be compelled to recognize their progressive competitors' advantage, in securing and holding trade and would follow their example. It is not to be expected that all founders knowing the advantage of working by analyses will advocate its general adoption. There are many to-day working by analyses who would prefer not to have its use extended, simply because they are satisfied to make the money, if their competitors are satisfied to plod along without being able to declare dividends.

In one sense blast furnacemen are not to blame if they are indifferent to exactness in analyses, for the founders utilizing chemistry are in the minority at the present day. The majority are indifferent or prejudiced against chemistry. Then again, we have those whose self-interest lies in advocating old practices and who, taking advantage of the majority's indifference, can decry the adoption of analyses. Their action is inimical to the advancement of founding, as is that of the politician, who, to gain office, will cater to ignorance for the purpose of catching votes.

But granting that the furnaceman has not at present every incentive to accuracy, how are we to expect foundrymen starting out to test the utility of analyses, to become its advocate, if his furnace report turns out to be incorrect? Is it not natural for such a founder to declare working by analyses unreliable, or not as good as judging pig iron by its fracture? All those who know working by chemical analyses to be the better way, when correctly applied, should labor earnestly to assist in bringing the whole foundry world to recognize its merit. When this comes about, no furnaceman will think of going out to his yard to select an open iron and mark it high in silicon, when he knows that the analysis shows it to be low. Nor would one continue shipping car after car from piles which he knew that through mistakes in keeping track of them, the office had got so badly mixed that only by reanalysis could it be learned what each pile was. Further, the furnaceman would be careful not to allow different "casts" to get so badly mixed up in one pile that when the founder received the car of iron he would find, should he check the furnace analysis, that part of it would not run much more than .50, while the other might run to 2.00 in silicon. The writer's firm has been the victim of just such indifferent and careless work, which illustrates what trouble may come to a founder working to analyses, but having no chemist to check up the furnace report, if shippers of iron are not careful and conscientious in their work.

Furnaces should recommend the use of chemistry to all founders, and to employ their own chemist, if possible, since it will lessen contention and bring their business

to a much more satisfactory basis. Before we had our own chemist, hardly a week passed without some furnaceman arranging for trouble or loss which his iron was causing. Since we have had our own chemist, we have had no occasion to interview the furnaceman (barring the question of well mixed "casts") other than to purchase his irons. Where is the founder having no chemist, or making his mixtures by judging fractures, who can say this?

UNIFORM CASTS OF PIG METAL.

The second need that may properly be discussed in this connection is uniform casts of pig iron. These may be so irregular at times as to make one end of a "cast" only suitable for making chilled castings, while the other end might be soft enough for light machinery or stove plate work, and yet all the iron might be reported under one analysis. This subject has been discussed by the writer and others in previous articles, but as it has an important bearing on the movement for "greater uniformity in the analysis of pig irons," I have here, as will be found, extended the subject in presenting new thought and experiences necessary to be added to what has previously been written to show the necessity of reform in this direction. A committee, of which I have the honor to be a member, is to bring this matter in its relation to uniform analyses before this convention for its sanction and co-operation. Nearly every car of pig iron illustrates in greater or less degree the evil of non-uniformity in furnace casts. I have seen, for an example, a car of which one sampling showed 2.00 in silicon, another 1.50 and a third .70. Much trouble and actual loss might result from accepting any one of these samplings as representatives. Could this evil be overcome, the experienced founder, having his own chemist, might go along for months at a time without experiencing any difficulty in obtaining to a nicety any physical qualities he had figured for his mixture, providing, of course, that the founder's chemist keeps a close tab on the sulphur contained in his fuel. The point made above applies more directly to the founder having but one mixture of iron to take out of his cupola at one "heat," and who from necessity must use his irons from the car or a small yard. Where founders have two or more mixtures to bring out of a cupola at one "heat" there is, of course, the liability of each affecting to a greater or less degree the other's qualities; but this is a question apart from that treated by this paper and is dependent upon the founder's experience and care in charging his iron. In sampling a car at the present day no less than five pigs should be selected, and these should be chosen from equal divisions from a car or cast of iron. In cases where the best care is desirable, it is sometimes well to make two sets of analyses, taking four pigs from each end, so as to divide the car in two sections, which should be separated to make distinct piles in the yard or on the cupola staging, where the various percentages of silicon, etc., in the different piles can be figured, to indicate just how much of each pile should be taken for the average desired.

Dr. Richard Moldenke gives an interesting article in THE FOUNDRY of January, 1898, describing a plan that may sometimes be adopted to secure a better mixed iron, than if it had been taken direct from the car for use in the cupola. It is to have all carloads of like reported grade piled one on top of the other and to draw from their ends to make up the charge, one analysis being made to answer for the whole pile. Drillings are taken of several pigs selected from each car and at the end all the different cars' samplings are mixed thoroughly together in one sample, which is then analyzed. Two entire trainloads of iron have been successfully piled and used after this manner with only one analysis for the whole lot. Where yard room is plenty or where one grade or mixture of iron is desired, such a system may often answer. Many founders are not situated so as to adopt this plan. They must use their iron to make several mixtures at one heat, or are limited for yard room, so as to be compelled to take their metal direct from the car. The best plan for the latter class seems to be that of taking the car analysis by the sampling system herein advised. Furnacemen by furnishing well mixed casts of their iron could assist such founders, as then no matter how many samplings might be taken from a car of pig metal, no two would be found to vary materially in analysis. It strikes the writer that any furnaceman who would work to this end and prove to his customers by actual tests in sampling, that each car of his iron will run uniform, would have no difficulty in placing his iron, and in many cases

at a price that would exceed that of iron furnished by those treating this subject with indifference. It is certainly worth something to the general run of founders, especially those who must use their iron direct from cars or small piles, to be assured that the one analysis of any car of iron coming to their yards will correctly represent both ends or any section of it which might be taken for a mixture. I believe that a few furnacemen have adopted the plan of dividing their "casts" in two parts and analyzing each section so as to give the purchaser several analyses of the one cast of iron. Such efforts are to be encouraged. There are several methods that could be adopted which the writer has in mind, but will not take space to outline, as any furnaceman who has an interest in furnishing well mixed casts can, with a little study, adopt or devise ways of doing so. Give the experienced founder a well mixed cast of iron and a correct report of its analysis, with a knowledge of the sulphur in his fuel, and it should be rare indeed for anything to occur to prevent his attaining to a nicety, day in and day out, the exact physicial qualities desired in his casting, especially where one mixture is used throughout a "heat." Unless he has these assurances, it is not just to hold a foreman or melter responsible for the results of his mixtures, any more than it is reasonable to expect a person to foretell the number of chicks that would come from a dozen eggs. Certainly our American Foundrymen's Association will have earned the gratitude of all makers and users of foundry irons, if it shall take steps to secure the practical realization of the end sought to be advanced by this discussion.

The Adoption of a Standard System of Test Bars for Cast Iron.*

By DR R. MOLDENKE.

The expansion of the general iron trade within the last quarter of a century has been phenomeral, and is bringing with it the natural demand for further and greater efforts on the part of those engaged therein. Raw materials, as well as finished products have been cheapened to an extent which makes our veterans sigh for the good old times of war prices; but the demand for quality has kept pace with the requirements of a more commercial character.

To-day a manufacturing founder who uses finished steel in connection with his castings when assembling his product, demands, or should demand, guarantees from the mill which will ensure for him the best material for his purpose. Competition will give him this at market prices if he knows what to ask for and how to ask it.

Similarly the manufacturer who buys castings has a right to ask for and receive the highest product of the molder's skill, combined with a material best suited to the work and the service it must endure. How shall the consumer know when he is getting the best castings for his purpose, or the founder that he is making them and is thus holding his trade. So far as the material is concerned, only by some means of comparison with well selected standards.

The fact that the knowledge and consequent use of such standards is as yet in a very crude state, as indeed are also the methods by which such comparisons are made, will in a great measure account for the many disputes between buyer and seller, leave the foundryman in constant anxiety regarding the behavior of the material after it leaves his eyes, and will sometimes make him feel that the quality of his daily product is a matter of mere guesswork.

It may not be generally known that now and then a contract awarded on given quotations is refused when it is learned that such and such an inspector is to look after its performance. An additional percentage is asked for to cover the expense incident to the unnecessary and vexatious demands such a man is notorious for making. This is in a measure due to differences in the interpretation of contract clauses not based upon definitely specified tests. Instances of large consumers of foundry product laying down laws of their own are multiplying. The intentions are usually fair, but those who know what manipulations a test bar may be made to undergo, sometimes find competitors taking advantage of this fact; or if compelled to work under specifications not suited for the purpose, will soon realize the uncertainty existing, and frequently have good castings condemned on the strength of a poor system of tests.

Early attempts at securing uniformity in testing materials for structural purposes emanated from the parties most interested,

*Paper read at the Cincinnati meeting (June, 1898), of the American Foundrymen's Association.

not only great consumers, but the actual owners of the works turning out these products. The supposedly disinterested portion of the trade, the practical investigator and the scientist, is only now coming to the front as an aid in solving problems well known to exist but not easy to fathom out.

A real need exists for means of comparison with standards by uniform methods. To quote from the report of the famous Munich convention, "it is universally acknowledged at the present day that the testing of materials of construction for their mechanical properties can be productive of comparable results, but only when made in accordance with uniform testing methods."

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The question of selecting the proper standards of quality is one foreign to this paper. Every man makes them for himself, if indeed these standards are not made for him by his customers. It is the aim of every progressive foundryman to know not only what kind of material his competitor is turning out, but also to see that he himself is doing at least as well. The method by which he may be reasonably assured of his standing as a foundryman, so far as the quality of the iron in his castings is concerned, is the study requiring our more immediate attention.

In matters relating to the founding of iron commercially we are undoubtedly ahead of European practice. This fact is shown by the immense and intricate castings for dynamos made here readily, whereas in Europe forgings of ingot iron, or low carbon steel, as we call it here, are found necessary to give satisfactory results. When it comes to a close study of the material we are working with daily, however, continental Europe at least is pushing us very hard.

It would carry us too far to go into the history of progress toward uniformity in methods of testing iron and steel. So much can be said, however, that not only has the work of unification been carried on by individuals and societies here and abroad, but commissions have been appointed by various governments for this purpose, and especially now does there seem to be some prospect of success, as nearly all concerned are uniting their efforts, and contributing their experience, for the general good through the medium of the "International Society for the Unification of the Methods of Testing Materials of Construction."

It remains for us to look more closely at the present status of the testing question from our standpoint as foundrymen, to see what information of value we may derive thereby, and how we can contribute our share to the general understanding of this most interesting material—cast iron.

Through the courtesy of the eminent metallurgists, Dr. Wedding and Prof. Martens, of Berlin, I have obtained information regarding the German practice, which is also said to be in current use in continental Europe. In substance it is as follows: Test bars 1 1-5"x1 1-5" in cross section and 44 inches long are cast in dry sand molds inclined 1" in 10, the running acting as feeder and pressure head corresponding to a vertical height of 8 inches. An extension 1"x1" is cast on the bar from which 1 inch cubes can be cut for compression tests. Of the 44 inches only 40 are intended for testing purposes, the transverse being the first method applied. For this purpose three of these bars are taken and their resistance to bending up, to rupture, together with the corresponding deflection noted. Two test pieces are turned up from the broken parts of each of the three bars for tensile tests, each piece being 8" long and 4-5" in diameter. Furthermore six compression tests are made with cubes cut from the broken test bars above mentioned, two from each bar, the pressure being applied as if the original piece were used as a column.

Two points of special interest to foundrymen are added as foot notes by the commission which labored to draw up these specifications. The regret is expressed first that the area of cross section of these bars is so small, and second that sufficient experience in casting bars on end is lacking. This would seem to imply, and rightly, too, that this method of casting is the preferable one. Without wishing to be critical I might add that the neglect of proper regard for the teachings of experience in both of these directions will prove fatal to any testing system which may be devised.

While tests similar in part to the above are in use in isolated instances in England and America, yet the testing of cast iron so far as a uniform system is concerned is in a truly chaotic state. Indeed, the famous metallurgist, Mr. Hadfield, of Sheffield, writes me deploring the lack of uniformity in this regard and wishes us success in accomplishing something of practical value in this broad and imperfectly cultivated field.

It is, however, not to be understood that there has been a lack of practical and hard work in this direction by our investigators. It is with considerable trepidation that I address you on this subject, when I review the voluminous and excellent work brought out especially in the last few years, by the members of our engineering and other societies from the more practical standpoint, and our professors from the purely scientific in addition. Indeed the foundation of what knowledge of the properties of materials I myself possess, was laid through the remarkably clear and thorough instruction of Prof. Hutton, whom you all know. Looking over the scope of the work done by the society of which he is secretary, and Messrs. Henning and Keep of its committee on testing methods, one is struck by the great mass of results obtained. Then again the Mining Engineers have among their transactions excellent literature on the physics of cast iron. The Civil Engineers, who have done much in the direction of standardizing methods, the rail sections and chemical methods, for instance, are awaiting at the present time the action of the international society regarding further extensions of this work. Then come our independent investigators. Mr. West, for instance, who not only bring out new lines of research, but help by their well meant criticism and effective counsel and work, to stimulate the larger bodies into higher planes of effort.

Thus we see there is a live and healthy movement in progress, in which it seems to me the time has come for us foundrymen to take part. At the outset I will say that there is only one way to ultimate success, and that is through a hearty co-operation with all engaged in similar lines of work. While we all look to an ultimate settlement of the testing question through the authority and standing of the international society, of which I sincerely hope we will become a member shortly, yet it is absolutely necessary that the pioneer work be done in national circles first, and the data thus collected and digested be submitted to conference committees of the international society for final adjustment and promulgation.

The question of testing cast iron is not as simple as it looks. A thousand and one items have their influence upon the ultimate result. Take the constitution of the metal in its broadest sense, and you have essentially a mineral which may, but very likely will not, be uniform in its structure. Some portions, then, are bound to be weaker than others, and to my mind only a plentiful multiplication of these variations, or in other words, a good big cross section, will give approximately correct results. These points, as well as many others of interest and importance, have been ably brought out by Mr. P. Kreuzpointner recently, and will be drawn upon freely further on.

We all recognize the fact that after all the judging of quality in a material by means of test bars can only be a relative one. Steel, after casting, is subjected to a variety of heat and working processes, leaving the structure of the finished product in a very different form from that of the original. Cast iron, on the other hand, remains just as cast. As there is no possibility of wiping out the chilling effect of the mold, the variation in structure due to casting temperatures, rate of cooling, etc., the test bars by which a casting is to be judged should approach as nearly as possible the peculiar conditions obtaining at the time. Is this possible or practicable? I fear not. And this is why there is such a diversity of opinion on the subject among practical foundrymen.

A review of the results obtained by the committee on testing methods of the American Society of Mechanical Engineers corroborates this, the discussions showing that while the results themselves can and will

stand upon their own merits, their interpretation is by no means settled, and will change as our insight into the material becomes better. It is therefore very proper that the final report should be delayed until all the data are thoroughly digested and every hiatus is filled out by the results of new lines of research.

What we foundrymen want just now is some system which will become quickly available, based, if possible, upon the experience already at hand, or requiring only a short time to perfect. A system which is cheap, quickly and easily carried out, and which gives trustworthy results. It has always struck me that the existing methods are not practical enough. Thus the German specifications present difficulties of a serious nature. Casting 44 inch test bars of so small a cross section is not likely to give reliable results. The compressive tests of cubes of cast iron are not often carried out in this country, although cast iron is essentially the material best suited for compressive strain. Test bars turned down from square bars to round ones only 4-5″ in diameter will have four hard and four soft spots, so to speak, in the circumference of their fracture area. On the score of reliability and cheapness the German system therefore leaves much to be desired.

In daily foundry practice, when a contract for regularly furnishing certain kinds of castings is received, it is customary to break up the first one made to detect, if possible, any weakness due to the methods of molding employed. At the same time the iron used, the methods of pouring it, etc., come in for their share of close scrutiny. If this is not done the lesson is liable to be brought home very soon by the customer. Railroads do this with their car wheels, axles, couplers, etc., as a regular method of testing the quality of the material on which so much depends. While this is the best way to assure oneself of the actual condition of affairs, the thing is not always practicable in the foundry trade. The next best method would be to cut out test pieces from finished castings rejected for some surface blemish not due to extremes of temperature of the iron poured. An opinion must now be formed as to the quality of the material and its adaptability for the purpose intended, and whatever system of testing is used for the daily work, this trial should always be made whenever expedient, to establish a relation between the general run of the metal and the actual results.

Now as to the regulation test bars which should show the quality of the material poured into castings. I will say at the outset that, in my opinion, a system involving the reproduction in every detail of the conditions coincident with the making of a casting, though very desirable, is a simple impossibility, and no reconciliation of opinions herein need be attempted. The only solution possible seems to be in avoiding as many of the disturbing influences as possible, and in this way aim to get the value of the material poured into the castings while in its best condition, rather than to obtain a poor imitation of the actual work. Good iron can easily be made worthless to a customer through poor molding and casting methods, but it would be folly to expect good castings with poor iron.

For the tensile test, then, a bar should be round and of large diameter. The peculiar requirements of the transverse test seem to demand a square and thick bar. Test bars should all be cast vertically to avoid the variation in strength in the upper and lower sides when cast flat. The effect of a dry sand mold should be obtained to remove all disturbing influences due to the varying dampness of green sand molds. These are a few of the points to be considered in the making of the test bar, its preparation for the machine requiring further study. It remains for us to strike the best average of these variables, which from the nature of the case cannot be converted into constants, and this brings me to the following recommendations:

First: That the American Foundrymen's Association authorize the appointment, by the president, of a committee on standard specifications for testing cast iron.

Second: That the American Foundrymen's Association become a member of the International Society for the Unification of Methods of Testing Materials of Construction; following in this respect the example of all other large societies interested in industrial progress.

If I may be permitted to add a few suggestions concerning the work of such a committee, I would advise first of all friendliness and co-operation with all others engaged in the same lines of work. Next a careful study of the results already published, and a tabulation of what in the light

of our present knowledge of cast iron is of real value. In the meantime a discussion of this subject by the various local foundrymen's associations would doubtless bring out much of value from the personal observations of the members and their friends. Some experimenting will be necessary, and plenty of hard work will surely fall to the lot of those honored by a call of this kind. It will be desirable to have a report prepared for our next meeting, even if not complete or wholly satisfactory to all; for what the foundrymen want is an immediate result in some definite direction. A report of this kind, if of sufficient value, can then be adopted tentatively pending further enlargement or improvement until finally merged into an international code for testing cast iron, in which I hope our American foundrymen will be heard from.

Should such a committee find time to enlarge the scope of their work more on the lines of the committee of the Mechanical Engineers, it might take up the question now being studied and warmly recommended to us by Mr. Henning, namely, the relation of expansion during cooling, and temperatures of cast iron. This and other questions relating to cast iron while fluid, during "set," and in cooling, would bring out a fund of information not easily obtained through individual effort.

It would not seem right for me to conclude this paper without offering some idea of a practical kind as a suggestion to those interested in physical investigations. It has for many years been my observation that a long test bar broken near one end and tested again, would give higher results than before. I have been able to repeat this up to four times on the same bar, the final result being a goodly percentage higher than the original test. Now for steel and wrought iron. Prof. Howe has ably discussed this phenomenon, and his "jog point" has become familiar to all testing experts. For cast iron, however, where the elastic limit is very close to the ultimate breaking strength, the elongation being for practical purposes a scientific curiosity, this cannot hold in so full a measure, and the test bar simply breaks at its weakest point. We get then not a measure of the quality of the iron, but simply that of the weakest spot of that particular test bar. Test the bar again and the next weakest spot is shown, and so on, until a fairer approximation of the actual conditions could be realized if the bar were long enough.

It was with great pleasure, therefore, that I saw in Mo ns. Barba's investigations a possible way out of this difficulty. He takes his test pieces and notches them deeply, so

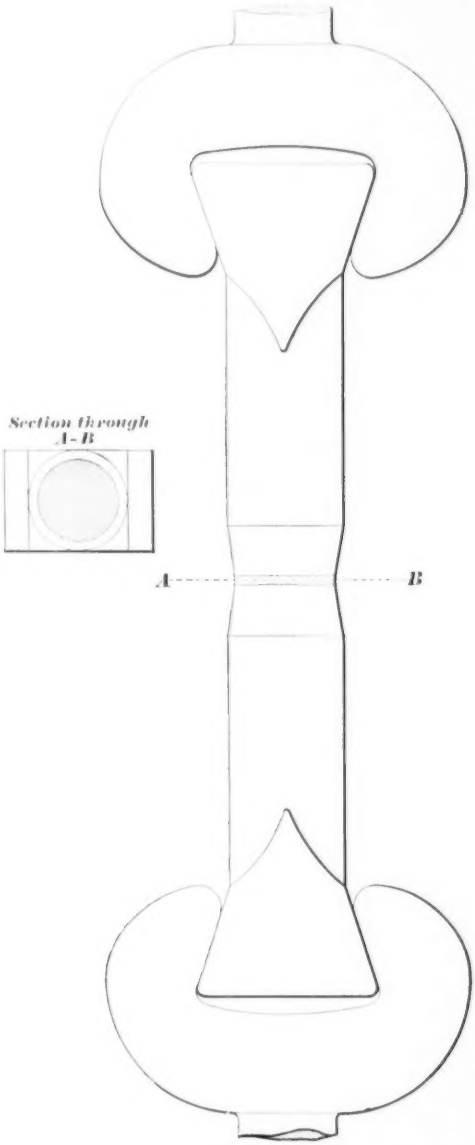

FIG. 1.

that they must break at a given point. The probabilities are that this spot is most likely representative of the whole material, and not one of the weak places, a fact borne out by a wide range of experiments on iron and steel.

I would suggest now that this system be tried for cast iron with this difference, however, that a test bar representing castings not to be machined should have the slight contraction provided for in the pattern, and for castings which require machining, the straight test bar should have a narrow groove turned into it. The accompanying cut will explain my suggestion more fully.

Fig. 1 shows the test bar in position for the tensile test. The contraction is shown at A B. It is only 1-4″ smaller in diameter than the balance of the cylinder, and is made about 1-8″ in length in order to overcome the difficulty experienced in obtaining a perfect V groove in a casting. When the bar is to be machined, as stated above, the contraction AB is omitted and the V groove turned into it before testing. It will be noticed that the ends are flat and taper outward, so that a bar may be held in solid clamps and be adjusted to receive the strain centrally. Since the taper is only on two opposite sides of each extremity of the bar, by laying it upon one of the other two, a transverse test may be carried out. Moreover this arrangement makes the molding comparatively easy.

An experiment made with a bar of this kind, and another of a uniform diameter equal to the contracted portion of the first, both bars cast in the same dry sand mold, showed a slight difference in their fractures. The contracted bar broke at the center and was coarser grained at that spot than the other straight bar, which, by the way, broke at one-third of its length from the end. This would show that the slower cooling of the metal in the heavier bar retarded the chilling of the contracted portion somewhat, resulting in less marked contrast between skin and interior.

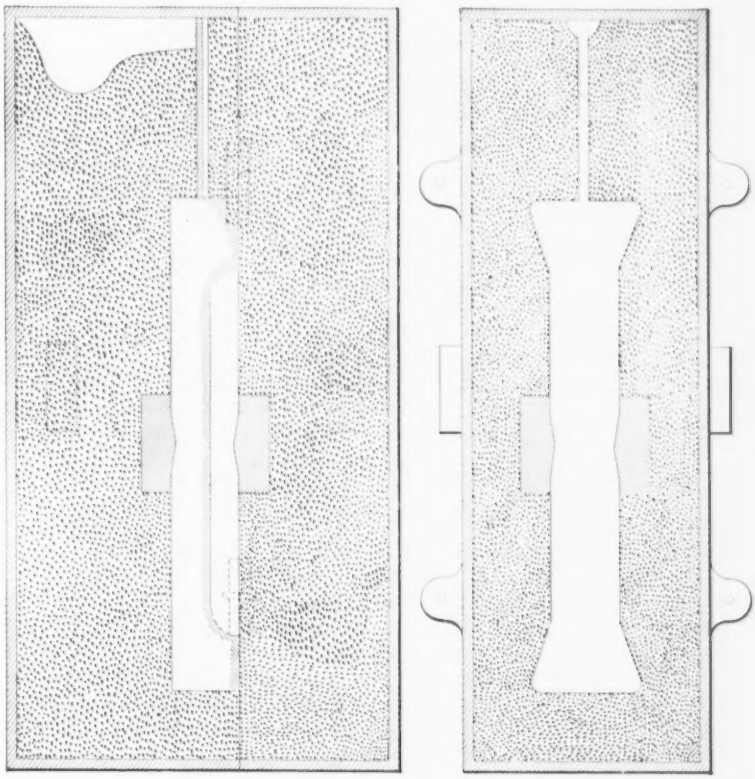

FIG. 2.

Now as I believe in having the thickness of the test bar comparable with the thickness of the casting, and as a 2″ specimen would seem the limit of capacity of our large foundry testing machines, I would suggest that at least three sizes—say 1 inch,

1½ inch and 2 inch—be selected, whether round, square, or both, as a committee may determine. In the plan I suggest for consideration you will notice that all shapes and sizes can be used, and where castings over 2 inches thick are to be represented, a 2¼ inch round bar with a ¼ inch groove turned into it will, by the removal of the skin, give a fair representation of such heavy work whether the castings are to be machined or not.

One last point. Not every foundry is prepared or willing to make dry sand molds, especially when a quantity of them are required daily. Fig. 2 shows a section through a green sand mold, in which you will notice that the effect of the dry sand is obtained by having the contracted area in a core. Not only is there the advantage of making these cores perfect in shape and without parting lines, but also the fact that they can be kept in stock gives us the means of obtaining the required effect quickly and without trouble.

I feel that I have dipped but lightly into an intricate and at times aggravating subject. When one has made some 60,000 physical tests in the last six years, and realizes that, although the test bars were made as representative of the material as possible, there can be no real comparison with the work of others in the same line of foundry business, there need be little wonder why I have tried your patience to-day in urging quick and practical action by the American Foundrymen's Association on this important but still so unsettled question.

Molding Connecting Rod Brasses.

One of the greatest troubles of the molder is the impurities in the metal. Many and ingenious precautions are taken, yet, in spite of all, dirt evades him and shows up in the casting, just particularly where it is not wanted. Much of this dirt cannot be separated by skim grates and such contrivances. Being lighter than the metal, however, it has a tendency to rise to the surface, and when any portion of a casting has to be exceptionally clean it is usual to get that part at the lowest point in the mold. With iron, as far as my observation goes, it is more difficult to obtain a perfectly clean casting than with bronze, as the metal usually contains more impurities.

Speaking of iron reminds me of a method of casting governor balls described to me by the superintendent of a large Western iron and brass foundry. Fig. 1 shows the method which I was informed gave much better results than to put the riser on top of the ball, as is usually the case. It will be noticed that the sprue was gated to the shrinker at a tangent to the lower curved surface, thus making it a whirl gate, so as to "ball" the dirt and keep it in the shrinker.

Bearing brasses are always cast bearing down, often making (owing to the manner in which the patterns are usually made) quite a difficult job of a simple one. Fig. 2 shows the method most generally used. The molding is commenced by placing the pattern bearing down on the follow board or match. The cope is placed over and the sand is rammed in. Upsets or deepeners, preferably of wood, A A, are used to increase the hight of the cope to at least 6 inches above the highest part of the pattern to insure the casting running up full. The cope is then inverted, the parting is made, and the nowel placed on, rammed and vented, after which the mold is again rolled over and the cope lifted off carrying the pattern. Thus the mold must be rolled twice, for even if the nowel is lifted, carrying the bearing core, the mold must be rolled when finished. Before the pattern is drawn, the sand around it must be spiked to prevent the corners dropping off when closing.

A great deal of ramming may be dispensed with, if, instead of carrying the mold up to the full hight of the sprue, it is made no higher than dictated by safety, and the sprue carried up by means of a bushing. In this case the pouring must be done with a shank, as the bushing would be displaced if the lip of the pot rested on it, as is usual with the side tongs. To insure a sound casting the metal must be hot, and the sand over the top of the casting must not be rammed too solid. If the metal is too cool, the casting will probably present the appearance shown in Fig. 3, which is a longitudinal section through the center of the bearing. It will be noticed that the back is hollow or "shrunk," and that there are shrinkage cracks at the juncture of the flanges with the body of the casting. In the case of hot metal and a hard rammed mold there will be the same "shrinkage" or hollow on the back; it will, however, generally

present a little different appearance, and instead of being smooth, will be rough or scaly and will suggest that after the casting was set a portion of the metal, rich in tin, had oozed out and spread itself over the hollow part. The same thing may often be observed with heavy sprues and risers of hard bronze. After the head has shrunk down and a skin has formed, metal will be seen to ooze from beneath and flow over the top, forming a button, which, when cold, is of a whitish color, and may be easily broken with a hammer, showing it to be rich in tin. It is only when the metal has been used hot that I have noticed this segregation of the tin. In the case we are supposing, of a hard rammed mold, etc., the gases being unable to escape freely, are compressed by the advancing metal and form a hollow. By the time the air has escaped the metal has begun to congeal, and a skin has formed on the outside of the casting. This skin is thinner at the hollow on account of the heat not being absorbed so quickly by the air as by the damp sand; the thin skin is not strong enough to withstand the internal strain, and it "bleeds." Sometimes this bleeding will entirely fill the hollow; in such a case that part of the casting will present a white "tinny" appearance, sometimes porous and sometimes not. The vent wire will sometimes antidote hard ramming, but not always. Often the back will be lumpy, "run up" where the vents happened to be and hollow between. I have expanded on this subject considerably, because I have seen much loss from this cause.

All this trouble may be avoided by the method of molding shown at Fig. 4. Here the casting is gated higher up, preferably on the flange on a level with the top of the box, and the sprue is of such a size as to be able to feed the casting; consequently lower copes may be used, cooler metal may be poured, and cleaner casting secured—labor saved all around. To secure these blessings the mold must be made in three parts. Fig. 5 shows how the pattern should be. The flanges above the body are loose and pinned. The pattern is given draught, so that it can be drawn by inserting the drawspike in the back, instead of in the bearing. In molding, the loose flanges are removed, and the pattern is placed, bearing up, on a smooth board (neither follow board or match is necessary). The nowel is placed over, rammed, vented, and rolled, the parting brushed off, loose flanges adjusted, gate patterns placed in position, and the cope rammed and removed, carrying with it the loose pieces. These and the pattern are drawn, and the mold is finished—quite an easy job. When the flanges, instead of being stralght, project at the sides to lengthen the bearing, such pieces can be loose, cast in aluminum so they will not break, and pinned, so that, after the pattern is removed, they can be withdrawn sideways. This alteration of patterns will save in the labor of molding no less than 25 per cent, and reduce the chances of bad casting to zero. The above remarks on shrinkage apply more particularly to heavy rod brasses; light ones give no trouble on this account; they are more

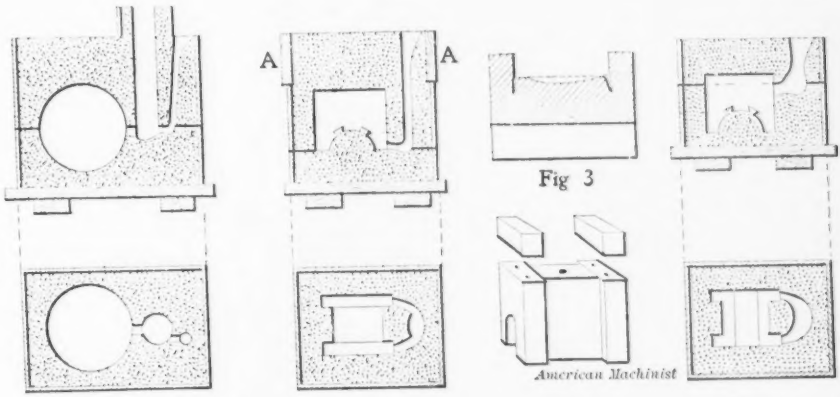

Fig 1 Fig 2 Fig 3 Fig 5 Fig 4

easily molded, however, if the patterns are made as suggested.—C. Vickers, in American Machinist.

Molding a Novelty.

The accompanying cut will show a casting in a single piece, the difficulty of making which will be readily appreciated by molders. The casting from which the cut was made was in the rough, just as it left the mold. It does not require the same kind of skill it is true, that is necessary for the construction of the mold for some ponderous piece of machinery, but calls for a good complement of patience, ingenuity, and careful manipulation to secure successful results. This cup, saucer, and spoons, with mustache guard and dolls, were cast in aluminum and make a very pretty and novel ornament when finished.

MOLDING A NOVELTY.

It was molded in this way: First, put the saucer on a board, inside down, and cover it with a cope, placing the sprue—a straight pop sprue—in the center of the saucer. Ram it up and roll over. Make a parting and then set the spoon on the saucer and bed it in place, making a parting to the end of the spoon. Set the cup in place, and put on the cheek, and ram up to the top of the cup; in the meanwhile setting the doll on the end of the spoon. The doll can be placed in almost any seemingly impossible position, by making a core from the pattern in two halves and jointing it perfectly, leaving the ends open or closed for the passage of the metal, according to the requirements of the case. We have the cheek now rammed up to the top of the cup; make a parting round the handle, then ram up one side and make a parting on the handle and ram up the other side. These are the drawbacks to enable you to clear the handle when withdrawing the cup. Provision is made for handling them by getting two pieces of tin made the shape of the parting on each side of the handle and laying them on.

The next thing to be done is to bed the spoon in the cup, make a parting to the end and throw on lots of parting sand. Put in a little sand and place an anchor in position so that the half of the core can be lifted out of the cup. Ram up until you come within one-quarter of an inch from the top, and place the mustache guard in position. The pattern for this guard is in two pieces so that it can be drawn out. Now for the dolls. As before they are made in a core. One is placed on the mustache guard and the nowel put on and rammed up to the top of the doll. Then set the bridge in position and make a parting up to the top of the nowel. On each end of the bridge place a doll, then ram the box

full and rub on a bottom board. The mold is now all rammed up, and we proceed to maneuver to get the patterns out. First, then, we roll the entire mold over. It will now occupy the position in which it will be poured. Drive four nails in the bottom board to act as guides, and lift off the entire box from the last parting, take out the bridge and close again; then roll the entire box over and lift off the nowel and cheek together, and withdraw the spoon from the saucer. Put a little paste around the parting and close the mold. Lift off the nowel and draw the spoon out of the cup. Again put some paste around the parting and close the mold. Turn over, lift off the cope and draw the saucer. Lift off the cheek, and pull back the drawbacks by taking hold of the tin at the bottom, and remove the cup. Draw out the pieces that form the mustache guard, replace the drawbacks and close the mold for good. Then say: "I wonder if it will be any good?" and pour it.—Fred MacDonald in Iron Molders' Journal.

The Present Status of the Cast iron Column.

The present status of the cast-iron column is one of those topics upon which much can be written without exhausting the subject. Engineers abandoned posts of this metal in bridges many years ago, and have since then looked upon the continued use of cast-iron columns in buildings much as a bull regards a red cloth, considering the practice a reflection by architects on the value of the special information on structural metalwork possessed by engineers. As a matter of fact, engineers were somewhat responsible for this condition of affairs, and part of it was due to the wide range of subjects an architect must aim to understand, making it impossible for him to specialize in any one. The organization of large architectural offices now provides for specialists in structural and mechanical engineering, as well as decorating and superintendence, and less is heard about faulty metalwork in consequence. Nevertheless cast-iron columns will undoubtedly be used for many years to come for small buildings, and it therefore behooves the architect employing them to understand why it is the old method of design and the tables of column strengths in the various handbooks are unreliable.

The trouble was caused originally by attempting to use a semi-empirical formula having an insufficient experimental basis to ascertain the ultimate resistance of cast-iron posts. Hodgkinson's classic experiments were made with little columns and subsequent data were obtained, until within the last ten years, by tests made with blocks. The results of tests of small posts and blocks, particularly of such a crystalline metal, could not be used with certainty in predicting the strength of large columns. Engineers had this brought home to them by experience with bridges as well as by studies of the properties of the metal, and on that account abandoned it years ago.

Within a few years a number of experiments on full-size, hollow, round cast-iron columns have been made at the Watertown Arsenal and Phoenixville, which supply definite information on the subject. In a recent number of the "School of Mines Quarterly," Prof. W. H. Burr made an analysis of the results of these tests, showing clearly the erratic variation in the strength of such columns. Two instances of wide variation in similar posts will serve as an illustration of this. In six columns having a ratio of length to diameter of 12.7, the ultimate resistance was found to vary from a little over 24,000 pounds per square inch to more than 40,000 pounds. These figures can be compared profitably with the ultimate resistance per square inch, nearly 47,000 pounds, of another column having a ratio of length to diameter of about 19. These differences are due to a variety of causes, foundry dirt, honey-comb, cinder, blow-holes, shifting of cores and many others, which operate in such an uncertain manner that the best practicable system of inspection does not always detect them.

It is possible, however, to estimate the probable strength of a cast-iron column much more accurately than is now the custom, by means of a new formula based wholly on the results of the full-size tests made of late years. If these results are plotted on a diagram in which the ordinates give the ultimate strength per square inch, as shown by the tests, and the abscissas give the ratios of length to diameter of the several columns, it will be found that a straight line having the equation $p = 30{,}500 - 160\,(1 \div d)$ represents the average of the plotted results. The equation of this line Professor Burr considers as a reasonable formula for the strength of such columns as are used in buildings, and "The Engineering Record" ad-

vises its readers to plot the line on a piece of cross-section paper, as a substitute for the tables in common use. The unreliability of such tables is readily shown if the formula on which they are based is plotted on the same diagram as Professor Burr's formula already given. The old formula is usually

$$p = \frac{80{,}000}{1 + \frac{l^2}{400d^2}}$$

If the corresponding curve is plotted as suggested it will be seen that at a ratio of length to diameter of 10 to 12, the theoretical ultimate resistance thus found is about double the amount shown by tests of full-size pieces. At the highest limit of the ratio allowed by the New York Building Law 20, the ultimate resistance by the old formula is half as large again as the amount actually found by tests. If the error were on the side of safety, architects might be excused for neglecting it, but being so large and on the danger side they should certainly abandon its cause. It is a simple matter to plot the two formulas on the same diagram, and by this means to solve without trouble most questions as to the resistance of such columns.

A valuable object lesson in the business policy of using cast-iron for struts is given in Professor Burr's paper, for in addition to the two lines just mentioned as useful in calculations of columns, he has plotted on the same diagram a line showing the ultimate resistance of mild steel struts, as determined by experiment. Such a comparative diagram indicates at a glance that mild steel columns have an ultimate resistance per square inch of section, nearly one and a half times that of cast-iron columns, with the same ratios of length to diameter. In commenting on this fact Professor Burr says: "When the erratic and unreliable character of cast-iron is considered, it is no material exaggeration to state that these tests show the working resistance per square inch may probably be taken twice as great for mild steel columns as for cast-iron." Architects, however, have to consider availability of materials as much as engineers, and it will often happen they can use cast-iron at a much less expense than mild steel, owing to the location of the buildings they are designing. Under such conditions, however, they should estimate the strength of their columns by the rule just given in order to be on the safe side, and the connections between columns and other structural parts should be scrutinized carefully before the order for the work is given to the builders.—Engineering Record.

Journal Bearing Metals.

The problem of reducing delays to traffic due to hot boxes is an old story. On the proper solution of this problem with its corollaries relating to journal bearing metal and lubrication, opinions differ widely. Especially do they differ regarding the respective merits of filled and solid bearings. Each form of bearing has its eminent advocates among thoughtful, conservative railway men. Those who favor the solid bearing are undoubtedly in the majority. We wish to consider, however, without discussing the relative merits of filled and solid bearings, the best means of obtaining a solid bearing to give maximum satisfactory service at a minimum cost.

Railroad companies have agreed with each other not to sell to junk dealers car bearings inscribed with the initials, or insignia, of a railroad company; the object of this arrangement being to put a handicap on the theft and subsequent traffic in this material. As a result large quantities of scrap bearing brass accumulate for which some disposition must be devised.

Experience has repeatedly proven that by using proper care and suitable methods a satisfactory bearing metal can be produced of practically all scrap material. There is, of course, no doubt but that bearing bronze composed entirely of new metal will be more uniform in composition and possess better bearing qualities than can be obtained from scrap material, but it is questionable if the superiority would warrant the 25 per cent. or 30 per cent. higher cost of the new material.

As a bearing metal which has met with considerable favor phosphor bronze may be mentioned. Phosphor bronze, more or less closely approximating the following composition, has come into extended use:

Copper	79 per cent
Lead	10 "
Tin	10 "
Phosphorus	1 "

this alloy being primarily an 8 to 1 bronze to which lead has been added to improve its

bearing qualities, and phosphorus, a strong reducing agent, to reduce such oxides of copper as may be present and thus render the metal close grained and homogeneous.

Assuming that in making a bearing metal from scrap we are aiming at approximately this composition, the materials used should be selected with this end in view. It is manifestly absurd to charge all sorts of disreputable scrap into a crucible and expect to pour out high grade phosphor bronze. The ordinary run of scrap available for use in car bearings is found to contain zinc, and generally an insufficient proportion of tin. The presence of zinc in moderate quantities is not necessarily a serious detriment, as more or less zinc is vaporized off in the melting. If tin is lacking its deficiency should not go unfilled. Enough tin should be added to form a proper alloy, and give the metal fluidity. Of course, tin is a high priced metal, but its moderate use is often necessary to obtain proper results.

As is well illustrated under the microscope, lead does not chemically alloy with the bronze, but is held in the mixture mechanically, very much as water is held in a sponge. As much lead should be added as the alloy will hold up. This is desirable for a two-fold purpose—lead improves the bearing qualities of the alloy and at the same time cheapens its cost per pound.

One of the most troublesome conditions encountered in the production of bronze bearing metals is the great affinity which oxygen has for copper and its alloys in the molten state. If care is not exercised in secluding oxygen from metal, the resulting bearing, on being fractured, will show discolored oxide spots, which in a car bearing are fatal to cool running. The oxide being harder than the unoxidized portion of the bearing is pretty certain to give trouble in service, for the hard spot if occurring in the bearing surface, is almost certain to form the nucleus for a "copper spot" and be the cause of a hot bearing.

Investigation of the cause and cure of "copper spots" has received much atention from people interested in bearing metals and from those whose chief concern is lubrication. If a bearing has run hot in service and is removed, almost invariably a portion of the bearing surface will appear covered with a thin film or skin, resembling copper. These spots have sometimes been termed "copper spots," and the theories evolved to account for the existence of these spots have been numerous and ingenious. The most simple theory appears the most reasonable, and seems to be fully confirmed by experiment. The theory is that if a bearing be ever so good, and perfectly fitting an absolutely smooth journal, if the bearing be run without lubrication, abrasion will take place, the detached particles of the bearing metal will be carried around by the journal and deposited in spots on the surface of the bearing. These spots gradually increase in thickness, so that the entire weight of the bearing is borne on this film-covered area. The result is that the pressure per unit area is excessive, the heating is accelerated, and this goes on until some means are taken to abate it.

In corroboration of this theory, laboratory tests have shown that, when a first-class bearing was fitted perfectly to the journal of an oil tester, load applied and run made, exactly these phenomena were observed, and the metallic film on analysis was found to be of exactly the same composition as the bearing metal.

In the matter of keeping bearing metal free from oxides of copper much good may be accomplished by preventing oxygen from entering the material in the first place. For example, a shovelful of brass turnings presents a vast area for oxidation. If these turnings are badly tarnished and mixed with dirt and dumped direct into a charge of bearing metal a large amount of oxygen goes into the metal. Suppose a crucible full of these turnings be melted by themselves and poured into ingots, if during the melting a liberal supply of charcoal be used, a certain amount of the oxides will be reduced and the ingots on being broken will show a reasonable freedom from oxides. The ingots may then become part of a charge for car bearings. By using turnings in this manner they become a benefit instead of a detriment to a bearing metal.

Three means may be employed to avoid the presence of oxides in bearing metal: First, by preventing badly oxidized and improper materials from entering the mixture; second, by protecting the molten metal from the oxygen of the air by a coating of charcoal or other suitable material; third, by reducing such oxides as are unavoidably present by means of phosphorus or other reducing agent.

Neglect of simple precautions in preparation of bearing metals may lead to very un-

satisfactory results and there is little doubt that to obtain a satisfactory bearing metal both methods and materials must be the objects of careful scrutiny.—Railway Master Mechanic.

The New England Foundry Foreman's Association.

By J. P. PERO.

At the present time when more or less interest is manifested in the different foundrymen's associations it may be appropriate to recount one of the earliest efforts made to bring this class of people together and the following sketch is a short history of what we believe was the pioneer association of its kind in America:

In the summer of 1887 the writer (then employed as foreman of the Yale & Towne Co.'s foundry at Stamford, Conn.) made a tour of the principal foundries of the east. The trip lasted six weeks, and during that time were visited all or nearly all of the representative foundries from Portland, Me., to Richmond, Va., as well as those of the Middle States, going as far west as Buffalo and Pittsburg.

This trip was intended as an educational one, the object of which was to study new methods and to pick up new ideas in foundry practice. Thoroughly impressed with the knowledge thus obtained, we reasoned that if such a trip were productive of good results, an arrangement by which the representatives of all the foundries thus visited might meet at certain periods for an exchange of views, and for discussion of matters pertaining to foundry practice, would be of inestimable value to them.

Encouraged by our employer we secured a list of foundrymen in New England and to each sent a circular letter or invitation to be present at a meeting held for the purpose of organizing an association, the objects of which are described in the rules and by-laws as follows:

1st. The holding of meetings at stated periods, for the discussion by members of topics relating to foundry practice, for the reading of papers upon similar subjects, and for the mutual interchange of ideas and experience among its members.

2d. The publication of the transactions of the Association for the dissemination of information among its members.

3d. In general, the improvement and education of the members, and the elevation of our trade, which of all trades is the most uncertain in its results, one of the least studied, one which requires the greatest education and skill, and one which is entitled to high rank among the industrial arts, by reason of the skill, experience, thought and good judgment, which its successful prosecution requires.

The first meeting was held Dec. 6th, 1887, at Springfield, Mass., and was attended by eleven members, the entire session being devoted to perfecting the organization. A code of laws and rules was adopted and the following officers elected:

President, I. W. Winchester, Magee Stove Co., Chelsea, Mass.; First Vice-President, R. H. Palmer, Corliss Engine Co., Providence, R. I.; Second Vice-President, J. N. Barton, Richmond Stove Co., Norwich, Conn.; Secretary, J. P. Pero, Yale & Towne Mfg. Co., Stamford, Conn.; Treasurer, F. W. Gibby, Mechanics' Foundry, Boston, Mass.; Councilors, Fred Davey, Sessions Foundry, Bristol, Conn.; Jos. Hennessey, Holyoke Hydrant Co., Holyoke, Mass.; Managers—J. B. Pero, Chapman Valve Co., Indian Orchard, Mass.; J. E. Witherell, Florence Machine Co., Florence, Mass.; Thomas King, Meriden Malleable Iron Co., Meriden, Conn.; J. S. Richardson, Howe Scale Co., Rutland, Vt.; H. B. Murless, Rockville, Conn.

Much interest was manifested by those present and after considerable discussion of general foundry practice, the meeting adjourned until July 10th, at Worcester, Mass. A special meeting was held Feb. 22d, 1888, at which were enrolled as members: Jas. De Neefe, Stiles & Parker, Middletown, Conn.; E. L. Burgess, C. B. Rogers & Co., Norwich, Conn.; David Matlack, I. P. Morris Co., Philadelphia, Pa.; Frank Kavanaugh, State Foundry, Rusk, Tex.

At this meeting the secretary gave notice of the intention to bring up a resolution at next meeting changing the name of the organization to The American Foundrymen's Association. It may be of interest to learn that the work of arranging the first meeting necessitated the mailing of 498 circulars and letters, the result being an attendance of eleven, but the mechanical papers were giving the association considerable notice, and inquiries as to the purpose and requirements of the organization began to increase in number, and, as a result, applications for membership were numerous and came from nearly every state in the Union.

At the meeting of July 10th, 1888, held at Worcester, Mass., a paper was read by R. H. Palmer, of the Corliss Engine Co., Providence, R. I., entitled "Mixing Iron for Cylinders and Engine Castings."

G. W. Winchester, of the Magee Stove Co., Chelsea, Mass., read a paper, "The Elevation of the Foundry Trade."

J. P. Pero read a paper, "A Technical Education for Foundrymen."

All papers were thoroughly discussed, and the remainder of the two days' session was spent in informal discussion on general foundry topics, among which the "Apprentice System" was prominent.

The next meeting was held at Worcester, Mass., Dec. 4th, 1888, and among other communications were read, "The Objects and Possibilities of the Association," from the pen of Thos. D. West. A "Question Box" was opened at this meeting, and many practical questions were asked and freely discussed, until adjournment.

This was the last meeting of the association, as at the meeting to be held in Providence, R. I., July 16th, 1889, there was not a quorum present, and no further meeting was called.

The organization died for want of support. The membership grew in the first year from eleven to nearly fifty, but the membership was scattered over so great an area, that but few of the members attended the meetings, and as the members were nearly all men under salary, the expense of attendance at meetings was no inconsiderable item, and while it was proposed to publish and mail to members, the proceedings of the meetings, this idea was abandoned on account of the expense. In some instances the expense of membership and attendance at meetings was borne by the firm represented by the foreman, but these cases were rare, and many of the members found their vacations used up, and much expense incurred by attendance at the meetings.

The association aroused considerable interest among foundrymen in all parts of the country, as is evidenced by the fact that the secretary in the first year of the organization wrote over 1,600 letters, on business directly connected with the organization.

This is a brief history of the pioneer foundrymen's association in this country, the idea of which was conceived, and the work of the organization performed by the writer, and which in his opinion was the parent of several similar organizations.

It is a hopeful sign of progress that within the past ten years it has been found possible to perfect an organization such as The American Foundrymen's Association, and to even the most thoughtless foundryman must come the conviction that through the medium of these organizations the next decade will see still greater advance in what is at last conceded to be an art, the work of the founder.

A New Steel Process.

It is well known that many of the failures of steel castings are due to what are called "flaws." Their detection in many cases is practically impossible. It therefore becomes a matter of very great moment to devise some plan by which the occlusion of air can be absolutely prevented, and a new invention by Mr. William Ellis May, of England, promises to do something towards this. In this process the castings are made in an air-tight chamber from which the air is exhausted, the mold or casting being placed in the chamber before the exhaustion of the air. A series of other chambers surrounds this chamber, each connected with it by a pipe controlled by valves. In these chambers a reserve vacuum is stored, the air from them being exhausted by powerful vacuum pumps. When a casting is ready to be run in, the controlling valves are opened and the residue of air in the casting chamber is instantaneously sucked out into the surrounding chambers at the same moment that the molten steel is poured into the mold. The casting thus takes place in vacuo; the air and gases rush out of the fluid metal and diffuse themselves in the vacuum chambers, and a flawless, homogeneous steel casting is the result.—Tin and Terne.

(Would it not be hard to keep the valves from leaking, especially if connected to a sand mold?—Ed.)

One Way of Molding a Tank.

In our May issue we published an inquiry as to the cheapest and best method of molding a tank 12 ft. long, 2 ft. wide and 7 ft. deep, thickness of metal ½ inch. Referring to this, Rolla Fowks, of Catskill, N. Y., writes:

"There may be a better way than mine, but if it will be of any use you are welcome to it. I would have the bottom of the tank pattern made apart from the sides when the mold may be rammed up in the floor without any trouble. A good cinder bed should be placed underneath the tank and care taken to have the mold rammed solid at the bottom, owing to the depth of metal. Vent down to the bed of coke as the mold is made, and rap the pattern from the inside before molding up the core. The core should be well secured, especially on the corners, and vented down to the bed. By venting well over the top of cope, the gases will be afforded a chance to escape before the metal runs over top of core and the casting will be smooth and free from blisters. As this is a quick way to make a tank of a large size, it must be a cheap way, as there is no back motion."

(From a hard earned personal experience we know that it is so much easier to tell how to do a thing than it is to do it. Our correspondent's way of molding a tank is simple and speedy, but we have a serious doubt as to the ability of the average good molder to produce a perfect casting of this size in green sand. Of course, if the mold is rammed right, vented right and everything else done right, there should be a good casting, but the fact remains that it is a great deal easier to say how to do these things right than it is to do them. A tank 12 ft. long and 7 ft. deep by half an inch thick is not such a plain casting to make as some might think.

As far as our correspondent's suggestion to have the bottom part of the pattern separate is concerned, why not leave that out altogether and sweep out the bottom? His advice to vent the cope well in order that the gases may escape that way before the metal covers the core is not exactly in line with the accepted practice of venting. We believe it would be altogether better to vent the core so that all gases could escape through the cinder bed from the start. Having the cope well vented with the intention of having the gases from the core escape that way would be in line with leaving the risers open for the same purpose. We should consider it better to let the gases escape in the direction they are ultimately expected to take, as the sudden reversal would tend to cause more or less agitation of the metal.—Ed.)

The Contrariness of Cast Iron.

Recent technical literature on the subject of cast iron is most voluminous, and its bulk is rapidly increasing. For some years past the American Institute of Mining Engineers and the American Society of Mechanical Engineers, to say nothing of a host of local engineering societies, have been regaled with papers and discussions upon the subject, and now we have journals devoted to the interests of the foundry and several foundrymen's associations, all devoted to the study of cast iron. Mr. W. J. Keep and Mr. Thomas D. West have enlightened us on the merits and demerits of different shapes of test bars, and they and other writers have written lengthy papers on silicon, carbon, shrinkage and chill. Major McDowell has recently beaten the record on tests of cast iron, having cast a sample with 49,000 pounds tensile strength per square inch. The New York City Building Department has shown us how cast-iron columns, supposed to have a factor of safety of 5, have an actual factor under steady central load of only 2.2, and no one knows how much less under eccentric loads or shocks. Many books and parts of books have been written about cast iron, and no doubt a book containing what we don't know about it would be larger than any of them.

But while the writers keep writing and the testing experts keep testing, the world goes on using cast iron in sections proportioned either by rule-of-thumb, or by what is far worse, Gordon's formula, and the cast iron keeps following its normal law, which is, "it is the unexpected that happens." In the form of railway car wheels it runs hundreds of thousands of miles, and stands millions of shocks, without breaking, and in the form of columns it breaks down before the building in which it is placed is completed. —Mechanical World.

I might as well try to get along without a molding shovel in my shop as to do without THE FOUNDRY.

W. F. MULLICA,
Algona, Iowa.

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Published Monthly by

"The Foundry Publishing Co."

DETROIT, MICH.

JOHN A. PENTON - - - EDITOR AND MANAGER.
HENRY HANSEN - - - - ASSOCIATE EDITOR.

SUBSCRIPTION PRICE:

$1.00 a year in advance, postage prepaid in the United States, Canada and Mexico.

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We invite correspondence on subjects pertaining to any part of the foundry business.

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Entered at the Post Office at Detroit, Mich., as second-class matter.

Let the Responsibility be Divided.

We hear so much nowadays about the qualities which the foundry foreman of the future will be called upon to show. A course in chemistry is one of the educational additions which it is proposed to make to his already long list of accomplishments.

These are times in which every man sticks largely to his own trade. If chemistry can demonstrate its value in the mixing of iron, then it ought to be plain that the metallurgical part of the foundry business should be turned over to the chemist, and that this individual should be responsible therefor. It is easy enough to say that the foundry foreman should learn chemistry, but the fact remains that he will no more do so than the chemist will learn the molder's trade. If chemistry will pay at all in the foundry, it will be when placed in the hands of competent chemists and not through any amateurish exhibition of a smattering of chemical knowledge such as would be obtained by the ordinary foundryman. Recent contributions to the trade journals on the subject of chemical analyses, show the ease with which errors may be committed, and if such differences in result are obtained by competent chemists, what shall we expect from determinations made by the foundry foreman to whom chemistry must be more or less of a side line?

Molding is a trade, and quite a complicated trade at that. Metallurgy of cast iron is a trade, more complicated still. It is more difficult to master than molding, for the reason that combinations alter each succeeding result. Many points occurring in everyday practice are in dispute between practical chemists, and if they cannot decide as to cause and effect, what can be expected of an outsider? When the time comes that chemistry enters foundry practice, let the chemist or metallurgical engineer have undisputed possession of his field, and let the foundry foreman stick to his molding. Each occupation is large enough by itself for any ordinary mind to master, and nothing whatever is to be gained by a scattering knowledge of both.

An Everyday Picture.

One of our readers in a small Illinois town writes us the following in regard to the conditions existing in the foundry business in that locality. The bracketed portions are our own:

"The Bulldozer Boiler Shop have closed their foundry and are buying their castings from the Skinner Co. (Undoubtedly they would not have done so, unless they were sure they could buy them cheaper than they could make them.) The Blowhard Foundry Co. are doing almost nothing. one molder and the foreman, who draws the princely salary of $60 per month, are all that are working there. (This shop would make more money if it got a foreman who could earn $120.) The Jerkdem Engine Works have four molders at work for $2 per day; they have cut Billy, the foreman, to $65 per month in order to keep up with the procession. (If Billy wasn't married to the town, he might get a job in some place else.) The Skinner Co. have every floor of their foundry running, as they have the work of the Podunk Railroad. But they are not making any money, even if their shop is full of work, for they are furnishing locomotive castings for $1.25 per 100 pounds delivered, car castings for $1 and brake shoes and grate bars for $0.80. They use all scrap except in the engine castings, but even at that it looks to me, without a convenient and modern shop (which they have not), as if they were paying out $1 to get 90 cents back. All the molders work piece work and

by putting in about 12 hours a day they can make from $2.60 to $2.75. (Wonder what those Chicago stereotypers would say to that.) And you can bet that they have to hump themselves to get that much. The molders are now agitating for a discontinuance of piece work and the adoption of day work, but if they strike they will be out of a job, for at the price the Skinner Co. are getting for castings, they are compelled to work their men piece work or give up the job. (And if the Skinner Co. gives it up there are any number of other foundries who will gobble it.)

Feeding Castings.

In our April issue appeared an article on the above subject from Mr. R. D. Moore. This was reprinted by the "Mechanical World," of Manchester, England, and the following letter also appeared in that journal:

"Mr. Moore believes that feeding any casting properly is much better than casting a head or ring above the casting proper, as it entails a useless waste of labor and consequently extra cost.

"Now, I must differ from him here, as I hold that wherever it is really practicable to cut a heading off a casting, either by turning or slotting, it is preferable for the soundness of the casting to do so, instead of relying upon feeding. It might be worth our while to inquire here what is feeding? What does it mean? If a mold is filled, why should you do any more?

"Most metals subside during the process of solidifying more or less, and cast iron is one of them. As soon as the mold is filled, the subsiding or sinking process begins. It may continue for a longer or shorter time, according to the thickness of the metal in the mold and the temperature of the metal when cast.

"Seeing, then, that this process takes place sooner or later, the molder makes provision on the top or highest parts of his casting, and of sufficient area to keep liquid longer than the casting may do, in order to admit fresh metal, which should be at a high temperature, so that the top of the casting may get what it is craving for—to take the place of the gradually subsiding metal. To aid and facilitate the passage of the new metal into the casting, a rod of round or square iron—from ⅛ to ¾ in., according to the size of the orifice—is kept in continual motion up and down until the casting has become solidified. Much evil has often resulted by this feeding rod being kept pumping too long in and out of the casting. Much evil also resulted from the feeding rod being withdrawn too soon, feeding the metal outside the casting. In the former case, a spongy, ragged foundation will be found at the bottom of the feeding gate; and in the latter, if the casting is heavy, probably a large hole.

"Very few molders indeed can feed a casting, as they invariably incline to allow the rod to remain too long in the casting, or they gradually work out the rod too soon.

"Therefore, by all means, wherever really practicable, cast a head above the casting, from 1 ft. up to 30 in., according to the weight of the casting below it. The thickness of that head ought to be at least double the thickness of the casting. In this way, a sound casting is sure to be the result, as the lower parts of the casting demand a supply from the top, and so the top will be supplied from the superstructure which is above it, as the latter is bound to remain in a liquid condition much longer than the casting itself.

"Mr. Moore speaks of a shaft he had seen in the street in Cincinnati, which was a little over three tons, and he tells us that six or eight small feeders were arranged to feed this 12-in. square shaft, and that underneath each one was a hole. Well, that goes without saying, and nothing else could be looked for. He points out that one on the end, having an area of 9 in., would have fed the casting sound. I wonder if he meant the shaft to be cast vertically? If so, I believe it would feed the shaft. But if it was horizontal it would not. The influence of that feeder—large as it is—would not travel 15 ft. when the shaft began to solidify. But cast it level, and three feeders 3 in. square or round, equally divided over the 15 ft., would make a sounder casting.

"Mr. Moore speaks of a guide pump stand ⅜ in. thick, and it had lugs on it an inch thick. The top of these lugs or snugs were hollow. Mr. Moore says it was for want of feeding, and the sprue or running gate was altered in order to feed the lugs, and it came off right. The molder said it was—or rather they were—blown, and the molder was certainly right in my opinion.

"No lug an inch thick attached to a ⅜ in. thick casting requires to be fed, but lugs of

this kind, even ½ in. thick or less, are exceedingly liable to be blown. Molders usually make provision for a small flower on the top of such lugs, say ½ in. square or round, and if one watches the running-in of the metal as soon as the mold is filled, it will be seen that these little flowers give a light vomit out of the metal. The little flower sets at once, not being able to retain metal; the lug is on the top of a shell of metal.

"This blow or vomit may arise from the sand being a little damp, or a little too hardly rammed. Either or both combined will cause the top of the lug to be hollow. Much more could be said on this matter, but I must consider your space.

"PIN KAMMER."

From a Steel Town.

The American Steel Casting Company, which has been one of the most successful plants of the kind in the United States, and which is the pioneer in the open hearth steel business, is to make an extensive extension to its plant. The addition will be a large foundry, and much larger than many of the kind in the country. When the improvement is finished it will make the American Steel Casting Company's shop, in this city, the largest in this country.

The improvement will be commenced during the next ten days and is an extension to No. 1 foundry, which will extend from the P., W. & B. R. R. to Fourth street, making a new building 177 feet long and 90 feet in width. The building is to be of brick and iron and of the same general plan as the present structure, which has been in successful operation for fifteen years. The building will be equipped with two 20-ton furnaces, ovens and traveling electric cranes with 30 tons capacity. There will be cold saws and many improved machines, some of which are now being made by Robert Wetherill & Co., of this city. The new building will give the company double the capacity that it now has on account of the increased floor space and the ovens to dry the molds in. There will be 17,000 square feet of floor space for the molders alone. This will enable the American Steel Company to have a capacity of 2,000 tons of the finest kind of steel castings per month.

The American Steel Company has been a very successful institution, as it was purchased from the Standard Steel Casting Company in the face of dullness in the business when there were failures on all sides. It has gone ahead, paid off the bonds of the company, paid a dividend on its stock, and the men at the head of the concern are now convinced that the success which has attended the managing of the business warrants the enlargement.

The plant is busy at the present time making government work. There is a great rush on the gun carriages for the 8-inch, 10-inch and 12-inch carriages, and there are orders ahead which will keep the plant running for months to come, as its standing in the steel market is such that much of the difficult work that is made is brought to the Chester shop for casting.—Chester Times.

Why Not Buckets?

The last section of the 8-ton iron keel to go to Essex was poured yesterday afternoon at the foundry of Albert Russell & Sons, in this city. These are the largest castings that have been made at the works since the last keels were cast a few years ago.

People who have never seen a large casting made have no idea of the work it takes to perfect one. The melted iron is taken from the furnace in large tubs, and by means of cranes swung to the molds that have been prepared to receive it. It took nearly three tubs of the metal to make the pouring. After the iron is poured it is left in over night, in order that it may cool gradually. Great care has to be used in every detail of the work so as to have the castings perfect. Should a flaw appear in the casting, it means an extra amount of hard work.

Mr. Runnels, the manager of the works, was much pleased with the success of the undertaking. There were quite a number of spectators present to view the interesting process.—Newburyport (Mass.) News.

Molding in Gray and Malleable Iron Compared.

By E. L. GROVER.

(First Paper.)

To one not familiar with the nature of both irons, it would, upon the surface, seem somewhat strange, perhaps, why a good gray iron molder should experience any difficulty when first molding in malleable iron. While there are classes of work which can be readily produced in either gray or mallea-

ble iron, there are others which puzzle even the experienced malleable iron molder, not so much to mold, but to mold and save, which could be produced without trouble in gray iron. One of the principal differences between the two mixtures is the great shrinkage of the malleable compared with the gray iron; and to overcome this is one of the molder's constant struggles. As a rule, any article squarely proportioned can be produced in either gray or malleable iron with equal facility; but when this is not the case, the excessive shrinkage and unequal cooling of the heavy parts must be overcome. For example, if a disk with a thickness of say half an inch, hollowed out in the center and connected with a hub of say six inches diameter by arms of same thickness as the disk, be poured of in malleable iron, these arms will be cold and rigid while the hub is yet in a semi molten condition. Hence, when the hub shrinks or contracts, the arms and disk being cooled off and unyielding, the result is a cracked arm. To overcome this defect, the hub is surrounded with chills, which cause the whole casting to cool off uniformly.

In addition to cases where the parts are not evenly proportioned, any article which has a sharp angle or lug rising from a flat surface should be chilled in order to produce a sound casting, otherwise the article will be very much weakened and will show a fracture of a dark spongy or honeycombed appearance at the points mentioned.

Chills are also used to a great extent in malleable iron foundries to produce a solid, homogeneous casting, and to keep the carbon in the iron in the combined state, thus making a much stronger casting after being annealed. In gray iron, the casting is kept solid and prevented from settling by using a riser or feeding head, but when used on a malleable casting the center of the riser will show a shrink-hole or honeycombed appearance, due to unequal rates of cooling between outside and center and consequent shrinkage.

Advantages of Hydrofluoric Acid.

We have received the following in reply to a question asked in our last issue by the "W. A. Machine Co.":

Castings have, until quite recently, been cleaned from sand, either by mechanical means or with diluted sulphuric acid. The first is expensive, takes considerable power and space, and is very disagreeable work on account of the dust it makes. Sulphuric acid loosens the sand by dissolving the iron from under it; whereas hydrofluoric acid dissolves the sand itself and therefore acts more promptly, takes much less acid and does not cause a loss of iron.

Hydrofluoric acid also dissolves more readily than sulphuric or muriatic acids the ordinary rust and magnetic (black) oxide that form on the surface of heated iron.

We furnish hydrofluoric acid in three different grades, containing 30, 48 and 52 per cent of pure hydrofluoric acid.

Our 30 per cent acid is shipped either in wooden barrels, containing about 300 pounds, or lead carboys, boxed in wood, containing about 100 pounds. The barrels should be emptied as soon as received into tanks lined with lead or well coated with asphaltum.

Our 48 and 52 per cent acids are intended more for the glass trade, and are shipped only in lead carboys. They can, however, if diluted properly, be used just as well for cleaning iron, the only difference being in the percentage of hydrofluoric acid.

The lead corbays have two openings, the larger (1 inch) pipe for pouring, and the smaller (½ inch) pipe for vent. Both are closed for shipment with cork stoppers, which should be loosened carefully, as sometimes gas is generated from the action of the acid on the lead, which may cause some of the acid to be thrown out if the corks are removed with too much haste. The acid itself is neither explosive nor inflammable.

The strength at which the acid is used varies with the kind of iron to be cleaned, and the time in which it should be finished, but generally it is used in proportion of 1 gallon of 30 per cent acid to 20 or 25 gallons of water, or one gallon of 48 per cent acid in 30 to 40 gallons of water. The acid should be poured into the water and well stirred. Such a solution will clean ordinary castings in one-half hour to one hour. If used only half as strong, that is, one gallon of 30 per cent acid in 40 to 50 gallons of water, it takes several hours.

Cleaning acid is used cold, but should be kept above the freezing point. The bath can be used repeatedly by adding about one-third the original quantity of acid before charging again with iron.

If it is desired to keep the iron bright, it should be washed with hot water immediate-

ly after coming out of the acid, so as to dry quickly. If washed with cold water it will remain wet for some time and rust. A little lime may be added to the wash water.

For cleaning all castings that are to be galvanized, tinned, enameled, nickel-plated or painted, this acid is vastly superior to sulphuric or muriatic acids, because it leaves a purer metallic surface and does not rust the plating or work through the paint.

As the strong acid will cause a painful inflammation wherever it comes into contact with the skin, it should be handled as carefully as other acids. Rubber gloves are the best protection; but if acid has dropped or splashed on the skin, it should be washed off at once with water and diluted ammonia, which will prevent any injury.

JAMES IRWIN & CO.,
Manufacturing Chemists.
343 Sixth ave., Pittsburg, Pa.

Benjamin W. Grist.

About thirty years ago Mr. Grist came to this country and engaged with Bennett, Mills & Co., of Philadelphia, later accepting a position with the Weimar Machine Works Co.,

of Lebanon, Pa., from where he went to the Lebanon Manufacturing Co., builders of steam engines. He retained this position until 1877, when he went to the Mellet Foundry & Machine Co., of Reading, Pa., as superintendent, later becoming associated with the Reading Iron Co. In the late eighties Mr. Grist organized the firm of B. W. Grist & Co., and remained as the manager of same until 1896, when it was merged into the then newly organized Pennsylvania Iron Works Company, when he became superintendent of the large concern and shortly afterwards vice-president and general manager. Mr. Grist has recently severed his connection with the Pennsylvania Company to become general manager of the Siemens-Halske Electrical Company of America, with headquarters in Chicago.

Feeding Castings.

By P. R. RAMP.

I have been so strikingly compared to a man who astonished all Europe with his skill as a dancer, that it seems only proper that I should return the compliment by stating that Mr. Moore would more likely astonish all America by feeding chickens and producing eggs than by feeding molds and producing sound castings. The few remarks I made about Mr. Moore's article in the April number, which he says does not touch the subject at all, I will endeavor to prove go near enough.

In the July number, in speaking of my remarks, he says: "He charges me with condemning the twelve or more inches of height of the cut-off ring or feeder on cylinders, etc., when there is not a word or hint in that direction" (see April FOUNDRY). Now certainly Mr. Moore's memory is not very good, or he would not make such an assertion. To prove that he did condemn the same, I refer to his article in the April number, where will be found the following: "We find loam molders an intelligent class certainly, continuing generation after generation a grave error, in feeding very important castings by continuing the mold of a cylindrical casting a foot or more above the casting proper, which will not feed a casting sound. The highest perfection can be attained without any of these unnecessary costs." Still further condemning the cut-off or feeding head, in speaking of some sugar rolls and steamboat cylinders that had been fed by the extension or cut-off rings, he says: "I had been condemning that practice as a violation of the true feeding principle." Further on he speaks of a "valve chamber 4¼ inches thick weighing 12 tons." Here he says "the cut-off ring was a failure." We might speak of a sunrise and a lobster look-

ing alike, but I fail to see a resemblance in the valve chamber to the 15-foot shaft; one was provided with a cut-off ring, or extension, the other six risers. If Mr. Moore said anything about the horizontal extension on the 15-foot shaft, I fail to see it. There are but few molders but what know that the six risers on the 15-foot shaft were not practical.

Mr. Moore has made it appear that I am in favor of putting as many heads on a casting as possible. But I am not. I merely remarked that there was a vast difference between the principle on which the valve chamber was fed and that by which the 15-foot shaft was fed. I cannot see what induced him to use the shaft for an example, as it has no bearing on the subject whatever.

He also makes the following remarks: "There is no escaping the conclusion that one feeding head is perfection; that one head possesses the highest feeding powers." Certainly, I agree with Mr. Moore that one head will do the work, providing it is large enough. I do not know what to call an extension of a foot or more on a cylindrical casting for the purpose of feeding, if it cannot be called one large feeding head. In his article in the April number, there is nothing said about the 20 feeders on the valve chamber. Had Mr. Moore said anything about using feeding heads on the valve, there would have been a resemblance of the valve chamber to the 15-foot shaft. But in the manner in which he described the two jobs, I see none. Still further I will say, Mr. Moore's single feeding head will not always work. We make 18-foot flywheels, 35 to 42 inches face, weighing from 17 to 22 tons. We use from six to eight feeding heads. The heads are not churned, but simply kept open and fed with hot iron. I would like to ask Mr. Moore if we can hold up the shrinkage 27 feet from the feeder, which would be about the distance from one side of the wheel around to the feeder, should we use a single head. Our reasons for not churning the wheels has been because the churning rod has a tendency to make hard chilled places on the rim of the wheel, causing a great deal of grumbling from the machine shop.

My object in pursuing this subject has not been to teach Mr. Moore the molding business, but having some knowledge of the molding trade, I, as a young man, realize the importance of making it a careful study, and see no reason why the young men should not be allowed to express their views. Of course it is but natural that the older men's experience should be considered. It is an old saying, and a true one, "You cannot learn an old dog new tricks." How many foundrymen you will find pegging away year after year in the same old rut, always looking back 20 or 40 years, when they should be looking forward. The methods used to-day in a modern foundry are altogether different than they were 40 years ago.

Something About Foundry Office Work.

By A FOUNDRY CLERK.

PRACTICAL COST-FIGURES.

In order to make cost-figuring effective, it should be done in such a way that not only the firm, but the firm's foreman also derives a benefit therefrom.

I will not say by this, that I recommend a system which will give a foreman more control of a firm's affairs than what is the regular custom in business; but, while I know too well that in most cases a foreman is engaged with the understanding to turn out work with the least possible cost, he ought to be informed what such least possible cost amounts to. He ought to be able to tell at the end of a month or a year how near a month or a year's product has come to the lowest mark. Practical experience and thorough study in this line of office work enables me to explain a system of cost-figuring in the way as I look at it, and I will therefore show the readers:

1. How to do cost-figuring for a firm at the end of the month, with the help of the product's value as per selling price.

2. How to do cost-figuring for a foreman at the end of the month, with the help of the product's value as per lowest possible (or foundry) price.

3. How to do cost-figuring for a foreman on certain single orders, or even single castings at any time during the month, in order that he may control the cost of the product under way.

My system would not be complete without those three principal points, as will be seen later on. I will now begin to do a little cost figuring, and for a basis I will use the monthly report published in the February edition of THE FOUNDRY JOURNAL (page 256). This report shows: 1. The total

product. 2. The total wages. 3. The total outlay for raw material.

Other expenses are not recorded for good reason in this report, but when I come to cost-figuring I must know what such other expenses amount to.

I will, for example, say, I am informed that the firm found that 15 per cent of the product's value will cover all other expenses, as power, heat, illuminating, delivery, repairs, interest on capital invested and so forth, and 10 per cent of the product's value is looked upon as a fair profit. Since I know that 400,000 pounds are produced, the next thing is for me is to find out what this product is worth per market or selling price. This is the most difficult point in cost-figuring. It is very particular work, and results in the forming of a production sheet, which will show exactly how many pounds are made of each class, even customers are classified. There is no room right here to explain the way to make such a sheet. This is a chapter of itself for later on.

Supposing now, I found that we made during the month:

150,000	pounds at	1¾c. equals	$2,625.00
100,000	pounds at	2c. equals	2,000.00
120,000	pounds at	2¼c. equals	2,700.00
25,000	pounds at	2¾c. equals	687.50
5,000	pounds at	5c. equals	250.00
400,000	pounds at	——	$8,262.50

I know now what the product is worth, and since I know all other items, I am ready to make my cost-figure report on the first principal point in the following:

Value of product per selling price		$8,262.50
Wages and raw material	$6,452.00	
Miscellaneous items, 15%.	1,239.37	
		7,691.37
Profit		$ 571.27

Profit equals 6.91 per cent or $2.85 and 63-100 per ton.

This report will show everything a firm is looking for, and is what you may call confidential. I will now explain the point No. 2, hoping that I may be well understood by most of the readers. Supposing a firm will make from year to year a fixed per cent for miscellaneous expenses, according to the finding on the end of a year, to this is added a certain per cent for clear profit as expected. Such percentage should be deducted from the regular selling price, and what is left constitutes the least possible or foundry price, for which a foreman must turn out work in order to satisfy a firm. As above mentioned the percentage amounts to 15 plus 10 per cent, that is in all 25 per cent; therefore the foundry price is 25 per cent less the marked price. Castings which bring 1¾c got to be turned out for 1 5-16c, such which bring 2c got to be turned out for 1½c, and so forth. In this order a foundry price is established, which will enable me to make a report for the foreman independent of the one which I have made for the firm, and this report will look as following:

150,000	pounds at	1 5-16c. equals	1,968.75
100,000	pounds at	1½c. equals	1,500.00
120,000	pounds at	1 11-16c. equals	2,025.00
25,000	pounds at	2 1-16c. equals	515.62
5,000	pounds at	3¾c. equals	187.50
400,000	pounds at	——	$6,196.87

Since I know all other items belonging here, I am able to make my cost-figure report for him on principal point No. 2 in the following:

Cost of wages and raw material	$6,452.00
Value of month's product	6,196.87
Deficit	$ 255.13

This report will tell a foreman all he needs to know, since there is a shortcoming he will naturally look for causes, and of what he may find in this direction I will tell a little further below, as I intend now to go over to the principal point No. 3, which relates to the foreman's control on a product under way. From experience while assisting a foreman, I have learned that his cost-figuring begins in the morning and does not always end in the evening, but may even disturb his sleep. In giving out work, hiring help, making floor arrangements and so forth, the problem of cost-figuring is solved in a way as the practical foreman understands it. Now in order that a foreman may turn out work for a stipulated price, let me say this is not always in his power, don't matter how good his management may be. Therefore, when he is in doubt whether he can come to requirements or not, he needs the help of the foundry office. Spread out for him the items of a certain order in a practical way, and it will prove to be the right thing. I can well recommend for the purpose a cost-figure sheet with the following headings: (1) Order number; (2) date; (3) number of prices; (4) name of casting; (5) weight; (6) molder's time with room for different rates; (7) molder's wages; (8) other wages; (9) miscellaneous; (10) remarks.

Whenever it should become necessary to figure on a certain order under way, I will proceed in the following manner:

From the daily foundry sheets as per date, I extract item after item with weight. To this I add the molder's time, rate and wages. After all the items are thus entered, I add up the weight and molder's wages. To the latter I add the officers' wages as per capita. The sheet is now given in the foreman's hands. He will carefully go over, and with the help of statistic data he will soon tell me what I must figure for raw material and other wages on this very order. It will not be long before I find what a certain product costs per pound to make. When more than one price is involved, a classification will have to be made. In this matter I have done quite a good deal of cost-figuring for the benefit of my foreman, and it resulted often in either dropping certain work, securing better prices, or in making special rigging and so forth. What is the use of making tons and tons of castings with actual loss?

Before closing I will come back to the deficit which I have shown above for a good purpose on the cost-figure report under point No. 2, to see what causes the foreman may have found. By talking the matter over with him I find: (1) That he is well aware of the fact that our monthly buying of raw material was too heavy; (2) that we took a big contract for which costly riggings had to be made; (3) that the loss of a few heavy castings during the month added considerable to the cost of production. The first and second causes are not considered losses. We know that we come ahead some other time. It is only the last cause which is found a dead loss in the management, and it must be straightened out somehow or the other. There are other existing conditions a foreman often must overcome, as there is a slight rise in wages and raw material. It may so happen that a gang of high-priced molders may have to be kept on cheap work in order to keep the gang. Indeed many more unfavorable conditions could be named which a foreman is bound to meet. For such reason a year's report may give a better show for him. At last, when on the end of the year, the value of the product by his price will balance the outlay for wages and raw material, he is in a position to tell that he turned out a product for the least possible cost, and the firm is sure of a 10 per cent margin.

This is my view of practical cost-figuring. Part of it I have carried out with good result, while the principal point No. 2 I have never carried out, but I found after assisting my foreman a good deal and after thoroughly studying the matter, that it may be worth while to mention this particular point in a trade paper devoted wholly to the interests of the foundry trade.

Making a Large Standardizing Casting.*

By THOS. D. WEST.

When the writer first conceived the idea of a national agency for distributing standardized drillings, as outlined in his paper, "Need of Greater Uniformity in Pig Iron Analyses," presented to this Association last April, he knew that to make this practical, a body of cast iron weighing from 400 to 500 pounds, free from all sand grit or slag, would have to be obtained, as no chemist would accept a sample for standardizing purposes that contained any of these impurities. It was also known that many would question the practicability of making a casting of 400 to 500 pounds that would be absolutely clean, solid and of a homogenous grain, so that when drilled or turned it would give a uniform sample for standardizing purposes. As a rule, chemists have found it difficult to obtain samples of even 25 pounds weight that would be reliable.

To obtain 300 pounds or more of absolutely clean and uniform drillings or turnings involves experience in heavy founding, but like all else, when once known, it is easily achieved. The plan is as follows: A mold of dry sand for the outer body and a dried core for the inner, are made as seen in the plan and section view at Figs. 1 and 3. The construction of the mold explains itself. The secret of getting a clean, solid casting lies mainly in the method of gating and pouring it. At A is a gate leading down to the bottom of the mold with an inlet at D. The round gates B, seen at the top of the mold, are placed about 4 inches apart and are ½-inch in diameter. A riser is seen at E. In starting to pour the mold, the hot molten metal is directed to drop from the ladle into the basin at the point marked W in a way that will permit it to flow gently down the

* Paper read before the Pittsburg Foundrymen's Association, June, 1898.

gate A and enter the mold at D, to prevent the bottom being cut by the top gates. When from 30 to 50 pounds of metal has entered the mold, a quick turn of the ladle empties a large body of the metal into the pouring basin, quickly filling all the gates at B; this then drops the metal down upon that which is rising from the stream flowing in at D. This action is kept up until the mold is filled and the metal runs out at the riser E. After this point is attained, the pouring is slackened and a steady stream maintained until from 300 to 500 pounds of metal has flown through the riser E to run down the incline seen at S, into the scrap pig hole X. The effect of causing such a large body of molten metal to flow through the mold, by making it enter the gate at A, is to keep up an agitation after the mold has been filled, which in turn will be most beneficial in causing the metal in the mold to mix well and counteract variations in structure that might otherwise take place. The metal dropping from the top gates B causes a disintegrating action, cutting into a fine dust any dirt that might accumulate upon the surface of the rising metal and which, were it not thus chopped up, as it were, into fine particles, would gather in large lumps, to be caught and held fast on the mold walls, with the result that dirt spots, etc., would be found in the casting, when its skin is removed by a drill, lathe or planer. Again, the fact that the metal drops from the top of the mold, besides entering at the bottom, causes the top body of the rising metal to be as fluid as that at the bottom, which is also beneficial in causing all scum and dirt to float upward with the metal, to the top of the mold or "riser head." Where metal fills a mold all from the bottom, it becomes rapidly duller in rising to fill the mold, an evil which will be readily seen. The writer, in the capacity of both journeyman and manager, has made almost all kinds and weights of complicated and difficult steam, gas and hydraulic cylinder castings, after the plan of gating shown in Figs. 1 and 3, and can say that whenever this plan of gating could be adopted, he has no recollection of ever having seen a bored surface (after the riser head was cut off), that displayed a dirt hole the size of a pin head, so perfectly clean and solid were such casts when finished. The writer is not alone in experiences of this character, as others familiar with heavy founding, who have followed the plan herein outlined, will agree

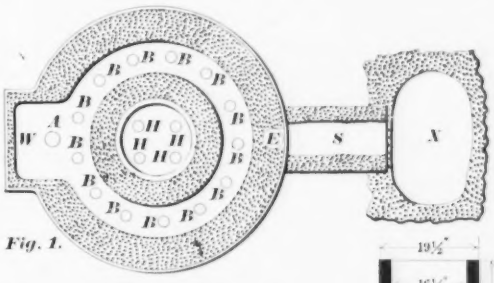


Fig. 1.

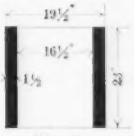


Fig. 2.

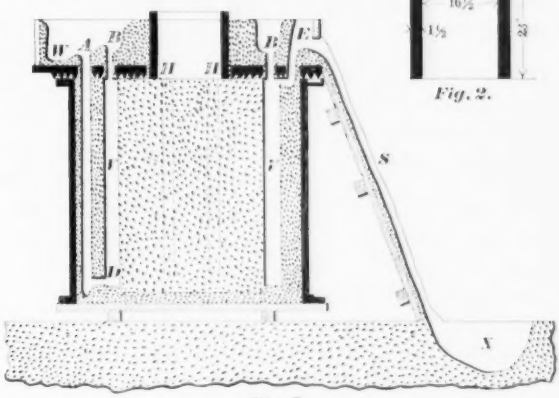


Fig. 3.

with the above statement. While this article is intended mainly to show the practicability of obtaining 300 or more pounds of uniform and clean drillings or trimmings, for standardizing purposes, it incidentally deals with practice that will be of use to the general molder or founder who may not have had experience in casting steam, gas or hydraulic cylinders.

Fig. 2 shows a section of the casting obtained from the mold, with the exception of four lugs, cast on to assist in holding the cylinder in the lathe while it is being turned. It will be well at this point to state also that there is no difficulty in obtaining castings running into tons, which might serve for standardizing purposes. The plan of securing these turnings or drillings is first to take off about ⅛-inch from the outside surface. These first turnings are cast aside, as they will contain more or less scale and dirt formed on the face of the casting by the fusing action of the molten metal upon the sand forming the face of the mold. After this surface has been turned off, and all the debris removed carefully from the lathe, the cylinder is turned until about ¼-inch thickness of an inner shell remains. The turnings obtained from the body after the ⅛-inch thickness is removed are the ones taken for standardizing purposes. It should be stated that about one-half inch thickness at the bottom and the "riser head" of two inches at the top are not disturbed, so as not to have the scale on the bottom of the casting or any dirt that would be collected at the top end, mixed in with the turnings obtained from the inner body of the casting. After the turnings have been thus obtained, they are passed through a 40-mesh sieve and thoroughly mixed, when they are ready to be analyzed, or standardized.

The molding and casting of this work is personally overseen by the writer. Two castings are being made, one of Bessemer and the other of foundry iron. The first casting is at this writing in the hands of Prof. C. H. Benjamin, at Case School of Applied Science, who is to manage the procuring of the turnings and the other work pertaining to distribution. Prof. Smith of the same college is to have charge of the analytical work. The reputation of both these gentlemen is a guarantee of the reliability of results. The silicon, sulphur, phosphorus, manganese, and both carbons will be determined and standardized. The methods used for determining the analyses will be furnished with the samples gratuitously to any desiring them. For the sum of $5 a subscriber will be furnished one pound of the drillings of all one kind, or half of each, as he may wish it, delivered to him. One pound should furnish enough material for 36 complete analyses or at least 200 separate determinations. At this writing, June 23, 1898, 30 firms comprising blast furnaces, foundries and steel works have sent in their orders for one pound of standardized drillings, which will be ready for delivery in a short time.

The manner in which this project was received and endorsed by the convention of the American Foundrymen's Association at Cincinnati, the fore part of this month, indicates the necessity and value of having one source from which all could obtain standardized drillings, instead of laboratories doing this work for themselves, as many do. It is hoped that before the close of this year, most of the laboratories dealing with cast iron, whether makers or users, will be subscribers to this central agency. Such an achievement is sure to lessen many of our present grievances and losses due to the lack of a national standard to assist the chemist in checking the results of his personal work, his methods or his chemicals.

Chill and Wearing Qualities of Car Wheels.

In a report by S. P. Bush presented before the Master Car Builders' Association the following data are given:

It is the chill given to the tread and flange of a wheel that enables it to be used and that gives it its wearing qualities. The total mileage life of a wheel depends directly on the depth of the chill, as well as upon the quality, but if two wheels, both having the same quality of chill as well as the same depth, the one being made of iron of high combined carbon, known as hard iron, and the other being made of iron with low combined carbon, or the tough variety, it would certainly be expected that both wheels would give the same mileage life so far as the chill is concerned, but the latter would withstand the heating of the rim, or the thermal test, better than the former.

Through the general superintendent of motive power of the Pennsylvania Railroad, F. D. Casanave, and the chemist of that road,

Dr. C. B. Dudley, I am able to present the following facts bearing on this point:

Twenty wheels were selected from those in service, representing some of the principal makes of the country, all of which were subjected to the thermal test, ten passing it successfully and ten failing. Chemical analyses were made of the iron of which these 20 wheels were made, two sets of samples being taken, one from the body, or gray iron, and the other from the chill. The result of these analyses is as follows:

Analyses of the Gray Iron. Stood Thermal Test.

Total carb'n.	Graphitic carb'n.	Combined carb'n.	Manganese.	Phosphor's.	Silic'n	Sulphr
3.68	3.00	0.68	0.64	0.30	0.56	0.11
3.54	2.74	0.80	0.28	0.47	0.65	0.10
3.50	3.48	0.02	0.35	0.40	0.45	0.13
3.65	2.41	1.24	0.31	0.53	0.57	0.16
3.73	2.89	0.84	0.88	0.38	0.50	0.11
3.63	3.03	0.60	0.44	0.43	0.56	0.12
3.67	2.70	0.97	0.24	0.38	0.53	0.10
3.67	3.03	0.64	0.32	0.42	0.47	0.16
3.64	2.53	1.11	0.33	0.50	0.62	0.12
3.86	3.31	0.55	0.30	0.36	0.63	0.11

Did Not Stand Thermal Test.

Total carb'n.	Graphitic carb'n.	Combined carb'n.	Manganese.	Phosphor's.	Silic'n	Sulphr
3.64	2.41	1.23	0.30	0.35	0.71	0.14
3.22	1.98	1.24	0.34	0.51	0.77	0.16
3.51	2.56	0.95	0.31	0.44	0.75	0.12
3.64	2.30	1.34	0.21	0.39	0.65	0.13
3.61	2.52	1.09	0.17	0.35	0.60	0.11
3.61	2.94	0.67	0.33	0.42	0.79	0.12
3.73	2.60	1.13	0.23	0.35	0.66	0.11
3.68	2.54	1.14	0.19	0.39	0.88	0.12
3.74	2.57	1.17	0.30	0.41	0.60	0.13
3.45	2.39	1.06	0.40	0.36	0.68	0.19

Analyses of the Chilled Iron.

Stood thermal test.			Did not stand thermal test.		
Total carbon.	Graphitic carbon.	Combined carbon	Total carbon.	Graphitic carbon.	Combined carbon
3.90	0.43	3.47	3.90	0.34	3.56
3.71	0.32	3.39	3.37	0.32	3.05
3.73	0.42	3.31	3.71	0.43	3.28
3.70	0.55	3.15	3.75	0.78	2.97
3.87	0.41	3.46	3.74	0.49	2.25
3.77	0.55	3.22	3.77	0.30	3.47
3.84	0.35	3.49	3.86	0.48	3.38
3.84	0.40	3.44	3.80	0.41	3.39
3.71	0.49	3.22	3.82	0.29	3.53
4.01	0.30	3.71	3.56	0.36	3.20

These figures cover determinations actually made. It was not deemed essential to determine the phosphorus, silicon and manganese in the chills, as there was no reason to think that they would differ in proportion from the same elements in the gray iron. In reality all borings for the two analyses were obtained not over 3 or 4 inches apart in the same wheel, the one being from the gray iron in the plate and the other from the chill. It is well known that the difference between chilled iron and gray iron in the same casting is in the condition of the carbon. It will be noted that in the gray iron the graphite is pretty well toward 3 per cent., and that the combined carbon is toward 1 per cent., while in the chill the figures are reversed, the variations being not far from one-half of 1 per cent. The figures giving the analyses of the gray iron are given for a comparison and as a matter of information.

The main point in these analyses, to which special attention is called, is the close agreement in the composition of the chills of these different wheels. If we take the averages of those that did and those that did not stand the thermal test, we find as follows:

	Total carbon.	Graphitic carbon.	Combined carbon.
Average of wheels which stood the thermal test.	3.81	0.42	3.39
Average of wheels which did not stand thermal-test..	3.73	0.42	3.31

It will be noted that the graphitic carbon is the same in both cases, and that the combined carbon only differs 0.08 per cent. Furthermore, the general agreement of the combined carbon of the chills in wheels from different makers is very noticeable and very remarkable. It is difficult to see how any other conclusion can be drawn from these figures than that there is no evidence, so far as the chemical composition is concerned, to show that the chills of wheels which stand the thermal test differ in their physical properties, so far at least as the physical properties depend on the chemistry of the metal, from the chills of wheels which do not stand the thermal test. Also, it seems fair to conclude that wheels made in different parts of the country and by different manufacturers do not differ very widely so far as chemical composition of the chills is concerned. It is quite obvious why this should be so, since the chill fixes the chemical composition within very narrow limits. Therefore, to emphasize what has been stated previously, it seems reasonable to

conclude that the wear of wheels depends on the chill, and if chills of various wheels are so closely alike as these analyses show them to be, there is really no evidence that the wear of these chills will differ to any appreciable extent.

Nothing Was Ever Too Good for Him.

Those of us who have traveled around more or less will recollect having been in contact with certain sepecimens of journeymen molders who, for absolute independence, took the cake. Of course they sometimes got into shops where their overbearing manners rendered the space they occupied more preferable than their presence, but who after all did not delight in seeing some tyrannical foreman catch a tartar who had gumption enough to stick up for his rights. Some shop foremen take pleasure in giving a man his time in addition to a good calling down on the most trivial pretense; in fact, it is a common remark that the man who tries the hardest to hold his job is the first one to get fired. The hard times and the specialization which has taken place in the trade has done much to kill off the one-time independent "hobo," who would just as soon quit as he would work, and who couldn't get his time any too quick to suit him. Billy McCarthy was one of these fellows and the boss at the Fulton Foundry soon found out that he had to treat Billy as an equal instead of running over him like he did the rest of the gang, yet Billy kept on kicking, first on one thing and then on another, and if he ran out of grievances on his own account he took up some of his shopmates' troubles that did not concern him. Finally he concluded that he had staid in the —— place too long anyhow, called for his time, and getting rid of the greater part of it in company with the boys he pulled his freight towards unknown fields, ready to give any cranky foreman he came across a dose of his own medicine. About six months afterwards Billy came back, a shade of his own self, after a long illness in a far-away hospital and struck his old boss for a job. The latter evidently thought that Billy's exhausted resources, financially and physically, offered an opportunity to teach him an object lesson so he replied about as follows: "When you were here before, Billy, there was nothing good enough for you, was there?" Billy gazed at him contemptuously for a moment and as he turned, ready to leave the shop, said: "That is so, Mr. ——, you are right about that. I will only ask you to remember one thing, and that is, that there is nothing too good for me now."

Western Foundrymen's Association.

At the July meeting of this Association the following discussion took place on the paper prepared by Herbert M. Ramp for the Cincinnati meeting of the American Foundrymen's Association, entitled "Trolley Systems in the Foundry:"

MR. COFFEEN—We use the overhead trolley system in the gray iron foundry, but I am a little bit at loss to give its comparative value because I never have used, on the same class of work, any other system. However, from what I have learned from men who use the old track system, especially for distributing the iron, there is a remarkable gain in the use of this plan and we have very little trouble with it. I have heard some criticism on the system concerning the trouble with the switches and the trolley. We have very little now. Whether that is the result of long experience in the management of the system or not, I can not say. On a good many of the floors for anything like large work we use a kind of overhead crane and pneumatic hoist. I suppose they are more or less like a trolley system. They make the work very fast on that class of work.

MR. CARVER—Can you describe in detail the system whether it is used direct to pour the molds, or simply as a method of carrying the gross weight to some convenient distributing point?

MR. COFFEEN—That depends on the work. Where the work is large enough to use a truck of iron, that is, 1,200 pounds and up, we use a crane for pouring, running across the floor and pouring right in the truck. We have some smaller cranes hung from a trolley; the crane swinging below. They are for lighter work, but they don't work so well. Such work as mower wheels and mower frames and the old style binder wheels we pour from the crane. All the iron is carried on this trolley system to the floors and some of the castings are carried out on that. It is not arranged now so that we can get castings out and get the iron around at the same time, so we take the castings out on a wheelbarrow and handle the larger part of the iron on the trolley.

MR. THOMPSON—If the trolley system, as I understand it, means the running of a trolley on a single rail, and is thereby limited to the direction in which it will travel. I think the traveling air hoist, which has a movement in every direction, limited to the span of the crane and the length of the track, is better. I think that a system of that kind can be put up in most any shop, no matter how low the roof is, and cover more ground to a good deal more advantage than a single rail system would. In regard to the handling of material from one department to another I don't think there is anything that can beat the surface track for that purpose. For handling castings from the foundry to the machine shop, for instance, a track with trucks will take a larger load of castings than can be handled on a trolley. It would appear to me that the amount of material that could be transferred that way would be quite limited. A load of castings may comprise several hundred pieces and these can be far easier handled by a truck than on anything which would be hung upon a single trolley track. About taking flasks to the yard, I think a surface track running past the end of each molder's floor, with the necessary turn-tables in the yard, will carry out more flasks in a given time and distribute them in different places in the yard than any trolley system. With the latter they would have to be reloaded on trucks after they got to the end of the foundry to go out in the yard, which would necessitate double handling. If we compare the trolley system with the old style of circle cranes, it is certainly far ahead of them in saving of space; but I believe that the air hoist cranes, which can be made to span from 10 to 20 or 30 feet are superior to a single track trolley system.

MR. ORBISON—I have seen the trolley system in several foundries, in fact, have worked at places where they have had trolley systems, but where they handled a lighter class of work. I do not think it would be practicable at all to handle a heavy class of work and I agree with Mr. Thompson in that respect, that there is nothing like the surface track. Where they make light work, bench molding, etc., for distributing the iron it is a very good thing, but I never knew it to be for anything else but distributing, when it is handled by hand for the different floors.

MR. GARDNER—Mr. Ramp says: "Formerly when an engine or boiler was to be loaded, or any machinery or castings, it was accomplished by hand. Now it is run under the trolley track on a truck and four or five-ton loads are picked up and loaded on the cars by two men in almost as few minutes."

MR. ORBISON—That is for loading; that is all right, I don't question that. But I can't see where the advantages to be gained are; the system certainly can't be put to any work other than the distributing of the metal, and you still have to do the pouring by hand, that is, the major portion of it. There might be certain molds that could be placed along the track and poured from the trolley. Outside of that, it could not be utilized unless by a series of switches. I have never seen the trolley system constructed, any other than on a double track, one track for out-going and one for in-coming ladles. Those I have seen were used for continuous pouring.

MR. THOMPSON—It would appear to me that a single track trolley system, in an agricultural shop, for instance, where they put up mower wheels on every foot of ground for a space of probably 30x50 or 30x100 feet and do the necessary lifting, would require a perfect network of tracks and switches, which would be more expensive than a single span crane of light construction with rails necessary to support it for the distance of the floor. I think the flasks could be handled quicker, as the hoists can be moved over the flasks without having to go back and forth to switches.

MR. CARVER—Mr. Thompson, haven't your firm recently equipped a large agricultural foundry with the trolley system?

MR. THOMPSON—No. We equipped them with the sand handling system, but I believe the Whiting Foundry Equipment Company equipped them with an air hoist system and light traveling cranes which cover the entire area of floor space.

MR. WALKER—I am a firm advocate of trolley systems in a foundry. Some three or four years ago I had the privilege of going through the Walter A. Wood Foundry in Hoosick Falls, N. Y. They used to run their iron on trucks on tracks. They have thrown them out completely and put in a double track overhead system. On their side floors, they took the overhead traveler and suspended to them air-hoists. The overhead

track that ran down the center delivered the iron to the side floors and the side floors carried ladles of their own. The ladle delivering the iron delivered it into the ladle on the side floor swung from the crane; the crane picked it up and moved it on until on the side floor they poured it off, doing away with helpers to help carry out the iron, shaking out their own molds and piling up their flasks; where it took half a dozen men to wait on the molder before, one and two men do it and do the most of it at night. At night a few men took the castings out and carried them to the cleaning room; a track ran into the cleaning room and switched off down the line of barrels and left all the castings right at the barrels where they were to be milled. This overhead system passed over overhead scales; there sat a man and took the weights; they went into their machine room and were delivered at the machines; when the machine work was done on them, they were taken from the machines to the setting-up departments on the same system. They were taken as finished machines and put into the warehouse. It would be surprising to anybody to go into that foundry to see the small amount of laborers' labor that was used; they cut out, they claim, fully one-half of the laboring work and did it with this overhead system. I was so much impressed with it that I came back to Rockford, where I was with the Emerson Mnfg. Co. then, and installed it on a small scale there. I didn't have an overhead traveler, as we found the work could be lifted without the aid of it, but I used it in distributing the iron. I found we could put jobs on the bench that practically were made on the floors before and poured off with small bull ladles. These were delivered with the trolley ladle by carrying the length of the floor. With the truck system, nine cases out of ten you stop at a given point, and deliver iron around to six or eight floors. With the overhead system of delivery, the iron was delivered direct to the floor and a man did not move from the head of his floor at all, but stood there and took his iron as it came along. I now have charge of the J. I. Case Foundry at Racine. I am going to install the overhead system. It is not as heavy work as some, running anywhere from 5 pounds up to 2,500 and 2,000 pound castings, down to little light snap work on separators. But I see no reason why the overhead system delivering iron to the floors with the overhead traveler and air hosit can not handle iron and castings weighing anywhere from 10 pounds to 2,000 or 3,000, and do it quicker and easier and save labor. Mr. Ramp says the saving is 50 per cent in some cases, 30 per cent in others and 10 per cent in others; depends altogether on what you have got to handle. I am so firm a believer in the over head system, that we are going to put it in and expect to pay for it in a very short time.

MR. THOMPSON—I would like to ask Mr. Walker if he refers to a traveling crane?

MR. WALKER—By overhead traveler, Mr. President, we mean a traveling crane. They cover the space of possibly two floors and from that overhead traveler hangs an air hoist. I would give more for one of the air hoists on a light traveler than I would for two cranes.

MR. THOMPSON—Have the traveler of 20 or 30 foot span?

MR. WALKER—The width of the girder; I could not say whether it is 15 or 18 feet. I will say for handling molds, in handling iron anywhere from 5 pounds up to 1,500 or 2,000 pounds, I consider the overhead system out of sight; that is a slang phrase, if you will excuse it.

MR. DYER—I won't say I am experienced in the use of the trolley system, but I am out for information with reference to it because we think we probably can save considerable labor by handling some of our material by an overhead traveler, which Mr. Walker has described. I don't know as it would be any advantage in a single track, one track going from the cupola and returning at the side some distance from it; I don't believe there would be any advantage in such a track over our floor tracks. In our work we have 800 to 1,000 pairs of iron flasks which are being handled at night and the breakage is quite an item. We have in mind the use of an overhead traveler with an air hoist on it for handling these flasks and stacking them up. I don't think we would at once discard our floor tracks for carrying the iron, but possibly we would. It has given us very satisfactory results. If any one can give me any information, or if I can find any information in reference to handling the iron flasks such as we use and cleaning up the floor at night, possibly getting the castings out on the trucks, I would consider it good information. The arrange-

ment of our factory would prevent us from carrying the trolley system into the shop probably, I don't know whether it would entirely prevent it or not; but we run up five stories and for that reason we thought that trucks were the easiest thing to handle in the factory. But we had in mind, as I say, the use of the pneumatic hoists on an overhead traveler in the foundry and I am anxious to see some in operation and hear from those who have them in operation.

MR. COFFEEN—In part of our work we use the overhead traveler and pneumatic hoist for shaking out, principally on the heaviest flasks on the mower frames. I don't know about the breakage of flasks. I don't think we break a very large number as we use iron flasks.

MR. JONES—I have never operated a foundry in which we had an overhead system otherwise than a traveling crane or a series of light overhead travelers, which I think possibly may be referred to in this article. So far as removing the flasks and taking the castings out of the foundry a system would have to be very good indeed to supplant a narrow gauge railroad through the plant. I have examined pretty carefully the working of the trolley system in the Sargent Co.'s works, that is, their gray iron department and if I am not very greatly mistaken, they pour all of their brake shoes direct from the single trolley rail. When I say single, I mean the right and left of outgoing and incoming trolley. They no doubt make a success of it; they handle a great deal of iron and handle it very rapidly; handle their flasks with it, a great many of them, though not all of them. Personally I have had no experience with the overhead trolley system.

MR. DALTON—We have electric cranes in our plant; we handle everything by electricity. The Atlas Engine Works, I think, have a very complete trolley system and pour everything by trolley I believe. The taking out of castings and handling of flasks depends a great deal on the location of your chipping room. The arrangement of our chipping room is such that it is between the machine shop and foundry. Our cranes run from one place to the other, and take our castings into the chipping shop.

They Are Happy.

Some time ago this office received a genuine cast iron invitation, which bore the following inscription:

THE BYRAMS INVITE YOU,
3:30 p. m.,
FRIDAY, JULY 1,
925 Biddle St.

We knew the Byrams were connected with the Cleveland Fence Co., of Indianapolis, Ind., but we were at a loss to account for the cause of the invitation. An inquiry brought the following information:

The event to which you refer, which, by the way, occurred in Indianapolis, not Cincinnati, was neither a wedding nor a christening. We have had a very prosperous year and simply invited a few of our friends to visit our foundry, giving them a light lunch with liquid refreshments, and then took them to the country for a genuine old fashioned country supper and a steamboat ride afterwards. The pleasure was marred somewhat, however, by our plant being visited by a fire the night before, which prevented our showing the foundry in operation. The fire occurred about 5 p. m. Thursday, June 30th. The loss was adjusted before 3 p. m. Friday, and we started the plant up again on Tuesday, with the open sky as a roof. How is that for a record? Total loss was about $3,000, all of which was covered by insurance, with the exception of about $500 on patterns.

Among the Foundries.

At Waukegan, Ill., Chas. Kressin has started a brass foundry.

James Higgins & Co. will start a brass foundry at Holyoke, Mass.

The Wellston (Ohio) Foundry Co. have begun operations in their new foundry.

The Standard Iron Works, of San Diego, Cal., recently completed its new foundry.

The foundry of Oelschlager Bros., at Berlin, Ontario, was destroyed by fire July 11.

The Petersburg (Va.) Iron Works was burned recently. Loss covered by insurance.

E. A. Garey, of Wyalusing, Pa., has purchased the entire interest in the foundry at that place.

The Ross Meehan Foundry Co., of Chattanooga, Tenn., is erecting a new addition to its foundry.

The Challenge Wind Mill and Feed Mill Co., of Batavia, Ill., will erect an addition to their foundry.

At Bath, Me., an addition, 135x65, to the machine shop of the Hyde Windlass Co.'s plant will be built.

Williams, White & Co., of Moline, Ill., will erect a new foundry, 80 by 160, and install a 15-ton electric crane.

The Rarig Engineering Company, of Columbus, Ohio, has the contract for a number of gun carriages for coast defense purposes.

The Centerville (Ia.) Foundry and Machine Co. has let the contract for the erection of its factory to Scott & Co., Lancaster, Mo.

The plant of the Angola Foundry and Machine Co., operated by Frank Monger at Angola, Ind., was badly damaged by fire July 7.

Reports state that the Winchester Repeating Arms Co., of New Haven, Conn., has let a contract for the building of a new foundry, 60 by 140.

The Avonmore Foundry and Machine Company, of Avonmore, Pa., have changed their name to West Point Foundry and Machine Company.

In anticipation of a large fall business the Fergus Fall Iron Works Company, of Fergus Falls, Minn., is having a number of improvements made to its plant.

Charles Straub, for some years foreman of Baker Bros.' foundry at Toledo, Ohio, died June 18 from injuries received the day previous through a large cope falling on him.

During a fire in the plant of the Racine (Wis.), Malleable and Wrought Iron Co., three men lost their lives and many sustained serious injuries. Loss estimated at $75,000.

The Vulcan Iron Co., Ltd., of New Castle, has purchased the Glover Foundry plant in that city, and intends improving the plant. A 15-ton crane will be installed, also a hoisting machine for charging purposes.

Marcus T. Moore has sold out his interest in the foundry at Pittsfield, Mass., to his partner, F. W. Hubbell. The foundry was established in 1846, and was known for many years as the old Bonney Foundry.

The Detroit (Mich.) Copper and Brass Rolling Mills have had plans prepared for important additions to their plant. They include a new foundry, 74x150 feet in size and one story, an addition to the main building on the south side, 76x130 feet in size, an addition to the carpenter shop, 36x60 feet, and a wire mill, 36x60 feet. All these buildings are to be of brick, the aggregate cost being $13,400.

The Peekskill Stove Works, of Peekskill, N. Y., have been sold to the William M. Crane Company. This has been one of Peekskill's largest foundries for the last thirty years, and was formerly known as the Montrose & Lent Foundry. The new company was formed last week with $250,000 capital, $200,000 being paid in. The officers are: President, William M. Crane; vice-president, Charles F. Terhune, both of New York city; secretary and treasurer, George H. Warner, Roselle, N. J., and Charles D. Shepard, superintendent, Peekskill.

A Modern Stove Foundry.

"From the raw material to the finished product is a phrase commonly used in speaking of manufacturing plants," said Mr. E. Raftery, associate manager of Rathbone, Sard & Co., Aurora, Ill., in the course of a conversation with a Reporter representative, "but the manufacturing companies and the foundries in this country which have their plants so arranged that the course is direct from the raw material to the finished product are few indeed. What I mean is that while actually the raw material passes through the factories and becomes the article or articles of manufacture, there are many steps backward, or a doubling back of the work. For instance, a stove foundry floor may be so situated that in delivering the castings to the tumbling room, it is necessary to pass through or around some department, to which they will, in their course to completed stoves, have to go later. This causes additional handling, time and expense. To illustrate my meaning more clearly, we will take a walk through our plant.

"We have here at Aurora the newest stove foundry in the country. Of course our concern, as you well know, has been in the stove business for sixty-five years at Albany. These years of experience, we think, have taught us many things in regard to the business, and it is but natural that when we decided to locate our Western foundry at Aurora, that we should embody into the plant many ideas for its systematic construction. We have also endeavored to make the different departments as comfort-

able and pleasant as possible for our men, and in this we think we have succeeded, for we have had no labor troubles of any kind since our locating here, and a number of applications are on hand at all times for positions in the different departments. Taken as a whole, or any part, we have the most modern stove foundry in the country to-day. Our plant here is laid out so that actually the raw material goes in at one end and comes out at the warehouse at the other end, the finished product, practically in a straight line; or, in other words, after the pig iron is put into the cupola it passes through in its different stages of manufacture each respective department in their regular order until the iron becomes completed stoves, ending in the warehouse and there packed for shipment.

"We will start at the beginning. You will observe our plant is built to form three sides of a hollow square; the total length, were it laid out straight one story in height, would be exactly one mile and a quarter, with an average width of one hundred and fifty feet. Here is our receiving switch connecting directly with the main line of the Chicago, Burlington and Quincy Railroad, which passes directly alongside of our warehouse. On this switch all material that pertains to our manufactured product is brought. The pig iron, as you see, is unloaded directly into our iron yard, right at the foundry floor door. We aim to keep a fair supply on hand at all times. What you see there will, roughly estimated, amount to about fifteen hundred tons. Our yard has a capacity of about three thousand tons. We will now step into the foundry proper. This is convenient to the pig iron yard. We are just in time, the men have just commenced to pour off a heat. You will notice the rapidity with which the molten iron flows from the cupola. Our cupola here is what is known as a fast running one. It is melting now about twelve tons an hour. It is possible to run it up to fifteen tons an hour. We are melting an average of thirty tons a day, and have been doing so steadily since January 5 of this year, and have been working during that time one hundred and fifty molders a day. There isn't a nook or corner in here where it is not light enough for any purpose. The roof is practically one grand skylight. Those large pipes you see overhead are warm air pipes to heat the building in winter. The men work here all winter long without changing their working apparel. Hot air is forced through these pipes by a huge blower. By heating our foundry we avoid any annoyance or delay from the freezing of our sand during a cold winter night. This keeps our sand in a nice workable condition. Our sand, by the way, comes from the Hudson river district, and is without question the finest molding sand obtainable anywhere. It actually costs us for freight alone more than we would have to pay for the ordinary run of molding sand five times over. It pays to go to the extra expense, as it enables us to obtain fine and smooth castings," said Mr. Raftery, as he stepped through a door from the molding floor into the tumbling barrel room, and picked up several castings which had just been removed from the tumblers. The castings were beautiful pieces of handiwork of the molder, being very fine and smooth.

"From here," continued Mr. Raftery, "after the castings are cleansed by the tumbling process, they go into the mounting room. This floor, with the one above, has a capacity of two hundred stoves per day. This great wide series of shelves and bins running down the center of the rooms, receive the castings as they come from the tumblers. They are taken as needed by the mounters. Here again we have plenty of light, all of the work being done close to the windows, while the numerous castings going to make up the stove are piled up in these bins, each casting or part having its separate compartment. The bins are accessible from both sides. The men here are working on heaters, those on the other side on cooks. You will notice there is no confusion, each man has his own particular portion of the floor to work in, all his materials are within easy reach, which, of course, facilitates his work. We will now step up stairs to our polishing room and nickeling plant. All castings for these departments are separated from the others, and are sent direct from the tumbling barrels here. Connecting the polishing room is our nickeling plant. Everything here, as elsewhere, keeps its straight course. All nickeled work is carefully wrapped in paper and stored within this room. We try to accumulate nickeled work in order to prevent our mounters from having to wait for the different parts.

"On the next floor is located our steel range plant and pattern shop. In our steel range department we have embodied the

same rule of no backsliding. You see here a sheet of steel which has just passed through this press, which, with one stroke, has punched all the holes required. Next this gigantic folder folds or turns the corners, and we then have the outside walls of a steel range. If you will walk down this line you will see steel ranges in many stages as they are being completed. Our next move, and the last one for the stoves, is the warehouse. This building is three stories high, 350x150 feet, and has a capacity of 28,000 stoves. Here are four extra large and powerful elevators for the rapid handling of stoves for shipment. All stoves reaching here are carefully packed and divided and stored according to their respective sizes and styles along the full length of the warehouse. At the side of the warehouse is a double switch, each switch accommodating fifteen cars. You will notice the entire front of the lower story of the building is but a series of doors. This gives ample room for many workmen to load the cars. Thirty cars are switched on these tracks each morning. They are then loaded and taken away at night, thirty more being switched on the next day. We are loading now, and have been since January 5, an average of thirty cars a day. One day recently we shipped forty cars. We are, as you see, within fifty feet of the main line of the Chicago, Burlington and Quincy Railroad, which gives us exceptionally fine facilities for shipping. Now," continued Mr. Raftery, "you have seen a stove grow from the raw material to the completed article ready to be wheeled on board a freight car to-morrow, to be shipped to some point perhaps near-by and perhaps thousands of miles away."—Stoves and Hardware Reporter.

Manganese Steel.

In a talk with a representative of the Age of Steel, H. A. Johann, sales agent of the Taylor Iron and Steel Company in the territory tributary to St. Louis, had this to say regarding manganese steel: Manganese steel is substantially iron with 15 per cent of manganese. It is manufactured in this country by the Taylor Iron and Steel Company, of High Bridge, New Jersey, sole licensees under Hadfields patents, owned by the Hadfields, of Sheffield, England.

It is so hard that it cannot be machined by the ordinary processes and so tough that even the lightest castings will not break under the most severe shock. The first property is well illustrated by some tests made in the St. Francois County lead mines; the Central Lead Company put a small casting of the metal under the drill press and wore the point off a Morse twist drill without cutting the steel; and at the Desloge lead mines, in an effort to dress down a small bushing of the steel, a man held it to a hard emery wheel for about ten minutes and managed to scratch it just once.

The latter property was strikingly shown on two occasions in coal mine accidents in Pennsylvania where the hoist broke, dropping the cage with the car, and both cage and car were completely demolished with the exception of the wheels, which were of manganese steel and were uninjured.

The principal uses have been for projectiles for the heavy guns in the navy and for mine car wheels, gears, pinions, sprockets and for wearing parts for granite and ore crushers, in which latter service it wears from five to ten times as long as the best chilled iron or ordinary steel. The United States Ordnance Department has recently adopted it exclusively for gun carriage shields in place of nickel steel, and it is now used largely for burglar proof safes, having been proved to be both drill and explosive proof.

Large quantities of manganese steel have been used for crusher purposes during the five or six years it has been on the market, in the mines of the West, in Alaska and in South Africa, and for rock crushing throughout the East. In Missouri and Illinois, however, it was first introduced about one year ago. The trials so far have given unqualified satisfaction, for pit car wheels in coal and other mines and for crushers in the granite trade, and in the lead and zinc mines of St. Francois County, and in the Joplin district.

Pickling Castings.

From the machine shop workman's standpoint I know very decidedly the difference between castings which have been pickled and those which have not. The proprietor or superintendent also should appreciate the difference in the wear of tools, with the time required for resharpening and resetting, and the more rapid wearing out and more frequent renewal of them, if used upon sand and scale, as compared with their use upon castings which have been thoroughly

pickled. With a just appreciation of the tool saving and the time saving effected by pickling, the cost of the process cuts a small figure.

As to the use of the pickling process for castings of considerable weight, I have my doubts, but principally because my experience has never had to do with pieces above, say, 200 pounds. Up to that weight and down to the smallest castings, I think they should be pickled if much machine work is to be done on them.

I have known two somewhat different processes employed for pickling castings. In the first way a lead lined wooden tank is provided of a size and shape determined entirely by the size, shape and quantity of castings to be handled. With a tank 6 feet by 3 feet and 2 feet deep a large quantity of castings may be pickled. The tank should preferably be sunk a foot or so in the ground. From one of the long sides there should extend back a long, tight wooden platform, say 6 feet wide and 12 feen long, with raised strips on the edges and a pitch of two or three inches to the foot toward the tank. The pickle in the tank should be one part vitriol to four parts water. A very common mistake is to think that more vitriol will hurry matters, or do the work more thoroughly. The reverse is the case, so an excess of vitriol is to be avoided. The water is of course put in first and the vitriol added gradually, as the addition of the vitriol heats the water. It will be well to fill the tank to within 6 inches or 4 inches of the top.

The articles to be pickled, if of convenient size to handle, are simply dipped in the pickle, so that they are wet all over, and then laid on the platform to drain and dry. If the castings are too large or too heavy for dipping they are laid on the platform and the pickle is poured over them with a dipper. They should be turned as much as necessary to wet them all over, and none of the castings should be left so that the pickle has a chance to settle in pockets or places that will not drain. The castings are then left for eight or twelve hours, when they will be covered with a white powdery substance. It is only necessary to dip the castings in boiling hot water, or to pour the hot water over them, until they are thoroughly cleaned of the acid, and when they are dry the process is completed. A hot water tank is of course provided, with a steam pipe for heating the water. This water should be renewed frequently or the acid will not be thoroughly removed. An additional refinement is to provide a hot potash or soda bath before the final rinsing in clean water. If by this process the first pickling does not sufficiently remove the sand and scale it may of course be repeated.

In the second process tanks are provided of sufficient capacity to submerge the castings for several hours. Sometimes they may remain in the pickle over night, and when taken out they may at once be rinsed in an adjoining tank of clear water, or, what is better, in two tanks in succession. The pickle for this slow pickling should be much weaker than for the first process, the vitriol not being more than one-tenth that of the water. I am inclined to decidedly prefer the first way of doing it.

This being the entire process it is evidently not an expensive one. I am unable to give any figures as to the waste of vitriol, but it lasts quite a long time. The only other expense is the labor. It is evident that one man can handle a large quantity of castings. In my opinion no establishment that has used thoroughly pickled castings will be likely ever after to be satisfied without the pickling. Tumbling is not a substitute for pickling, as it does little toward removing the scale. Tumbling before pickling is good and saves the pickle. Pickling without tumbling is better than tumbling without pickling, so far as the wear of tools is concerned. There is of course a place where it is desirable, and beyond that a place where it is imperative, to draw the line as to pickling. All castings do not require pickling, and many castings it will not pay to pickle, but it will not pay to abandon pickling for a manufacturing machine shop of any magnitude.—Morris Fulton in American Machinist.

Specifications for Cast Iron Pipe.

One of the papers receiving the most attention at the recent meeting of the American Water Works Association was a discussion of the best methods of making cast iron pipe and the specifications for this material, written by Mr. P. D. Wanner, whose long experience, both as a foundryman and a water works manager, gives particular weight to his statements. The main ideas he advocated were the following:

First—The metal used should be a No. 2 X or No. 2 plain foundry iron remelted in a cupola or air furnace, and of such quality and mixture as will produce a strong and even grained pipe or casting that will drill and cut readily, and possess a tensile strength of at least 16,000 pounds per square inch.

Second—Pipe should be cast vertically in dry sand molds truly cylindrical in shape, uniform in thickness of metal, in sections of 12 feet exclusive of bell, with bell end down. The seat or shoulder of the bell and the spigot end should be even. It is conceded in the art of pipe-making at this time that they should be cast vertically for obvious reasons, such as greater solidity, regularity of metal, and less chance of air bubbles and of dross remaining in the pipe. They should also be cast with bell ends down, as this will produce a more perfect head, more shapely in form and of greater regularity in depth of socket and metal. Definite action in the specifications on this point would be of advantage to pipemakers, and save them the expense of maintaining a double complement of fixtures. Some engineers are determined, others indifferent, as to this practice. While, perhaps, a majority of the specifications call for bell ends down, many of them are not enforced, and in the majority of such instances the pipe are cast bell ends up as a matter of economy and convenience to the pipe-makers.

Third—The depth of the socket or bell, with a suitable V-shaped lead ring, should be from 3.5 to 5 inches, according to the diameter or size of pipe; joint room or lead space from five-sixteenth to one-half inch, with number, year and initials of the manufacturer cast in raised letters and figures upon each pipe or special.

Fourth—The thickness of metal, weight of pipe, with a fair allowance for variation, say, from 3 to 5 per cent, should be regulated by the head or pressure to which the pipe is to be subjected, and correspond to the drawings and instructions of the engineer, who should always endeavor to remain on the side of safety, and not to forget that it is but small economy, especially during these low prices of pig iron, to recommend light-weight pipe even for the lightest pressure.

Fifth—The pipe and castings, after coming out of the foundry, should be thoroughly cleaned inside and outside, chipped nicely and then carefully inspected with a light pick-hammer for that purpose. After this inspection the pipe and specials, for water, should be properly heated, and while hot dipped into a suitable preparation of coal tar mixed with a sufficient quantity of dead oil to give it the requisite body and gloss; the coating, after it is applied, should become hard and tenacious and show no blisters or flakes. The coating on pipe and specials, while an important feature in the trade, is of easy attainment, with the proper materials and management.

Seventh—Pipe should be tested by a machine built for that purpose under hydraulic pressure of from 100 to 300 pounds to the square inch, according to the use intended, giving the pipe while under this pressure a few slight raps with a light iron or wooden hammer.

Eighth—After testing the pipe they should be weighed and the weight of each marked in white lead, either in the bell or on the outside. Pipe and castings should be sold by the pound or the legal ton of 2,000 pounds. There is no so-called gross ton of 2,240 pounds for pipe or castings, and it can be made obligatory only by special contract in writing. This ton should not exist at all, and there is no reasonable excuse for its maintenance by anybody whatever. It is annoying alike to the buyer and the seller, as well as to the railroad companies and other carriers. It is a nuisance that should have been abolished long ago.

Ninth—Time for the beginning of shipment of pipe, quantity per week or month and time for completion should be plainly stated in contract, and without penalty for non-performance of contract on time, because it cannot be enforced at law; and why, then, encumber the contract with it or attempt to frighten the souls of the contractors?

Tenth—Terms of payment should be 30 days cash, unless otherwise agreed, after the delivery of pipe and castings, less 10 per cent to be retained until the satisfactory completion of the contract.

Eleventh—A bond may be required in from one-fourth to one-half of the amount of contract, with sufficient security, rendered by a surety company wherever the same may be practicable.

Parties inviting proposals or bids for pipe and special castings should refrain from asking for bids made on their own proposal

blanks or for cash or checks, because this practice is not binding and is against the policy of law, of no service to them and frequently annoying and a hardship to the bidders, who are, in any event, dependent upon the favor and tenderness of those inviting them to bid under the invariable reservation or right "to reject any and all bids."

Special castings should be cast upright or on an incline in dry sand or loam molds, though small specials, with care and good management, may be cast successfully in green sand molds. In connection with this subject I would state that it is very much to be regretted that the engineers of the larger cities and water companies should not have agreed heretofore upon some uniform system of specials. It would have saved many thousands of dollars to the pipe-makers on patterns, flasks, core boxes, etc., and have been of great convenience to those using them. As it is, Philadelphia has its system, so has New York, Boston and others; Philadelphia having, probably, the most complete of all, though they lack, like their pipe, thickness of metal.

The fault in specifications too often, outside of provisions that are unreasonable and cannot be fulfilled, lies in their being drawn too rigidly against the contractors and manufacturers, who are treated, and seemingly looked upon in the outset, as if they were both dishonest and incompetent. There was a time when some of them were, perhaps, slow in filling orders and inclined to take advantage of the prosperous condition of their trade, but that day has gone by. They are now reduced to the smallest possible profits, if any; their lot is not cast in pleasant places, and I am sure that they are entitled to fair and reasonable treatment.

The Joseph Dixon Crucible Co., of Jersey City, N. J., have mailed us a copy of their sixth edition of "Graphite as a Lubricant." As indicated by the title, the pamphlet deals with the reduction of friction through the application of graphite, of which the Dixon Co. makes several varieties, suited to different purposes and conditions.

Ask no Questions.

Don't ever ask us if we want a renewal of our subscription to The Foundry. Always take it for granted we do. Enough said.

MERRIMAN & TILDEN.

Hinsdale, N. H.

CAST IRON NOTES.

Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

UNEQUAL SHRINKAGE OF IRREGULAR-SHAPED CASTINGS.

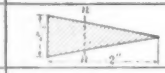
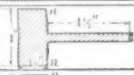
Question.—Knowing that if a bar ½ inch square, and another 1-10 inch by 1 inch, both 12 inches long, were cast from the same gate, the thin casting would become solid first and would shrink most, I made one casting 12 inches long by 1 inch wide, one edge being 1-16 inch thick and the other ¼ inch thick, and I made another 12 inches long and 1 inch wide and 1-10 inch thick, and placed on one side along the central part a flange ⅜ inch wide and ⅝ inch high. When cold, both castings were concave on the heavy side. This seems to contradict the record of the shrinkage of the above square and thin test bars. The impression is common among foundrymen that the heavy parts of a casting shrink more than the thin parts. This I do not believe to be a fact, and yet my experiment seems to prove that the impression is correct. Can you help me in harmonizing these contrary results?

Answer.—A thin part of a casting will in all cases shrink more than a thick part. As a general thing this uneven shrinkage will cause a casting to be crooked.

The following figures show the behavior of a number of castings which I made sometime ago:

The length of all the castings except Fig. 12, was one foot; other dimensions are marked on the sections. Castings Figs. 2 and 3 are the same shape and size as the portions of Fig. 1. Figs. 5 and 6 are sections of Fig. 4. Figs. 7 and 8 are the same size as the test-bars mentioned in the question. Fig. 9 is a section of a casting one foot long and 2 inches wide, with a ½ inch rib on each edge. Fig. 10 is the same shape as the second experimental casting described in the question, and it behaves in the same way, but exactly opposite to the behavior of the castings shown in Figs. 1 to 4. Fig. 12 is a casting with a thin top and with a heavy rib around the edge. Fig. 11 is the same as Fig. 4, but has a portion of the thin rib cut away where it joins the thick part. All castings were poured from one ladle of iron. The iron from which all

of the castings were made contained G. C. 3.05. C. C. 0.09. Si. 3.50. P 0.975. S. 0.088. Mn. 0.50. The ½ inch test-bar (Fig. 7) had a shrinkage of .121 inch per foot; had strength 416 pounds, deflection 0.25 inches. Deflection at 300 pounds, 0.17 inches. Set at 300 pounds, 0.02 inches. Depth of chill, 0.05 inches. This was therefore a non-chilling iron. The ½ inch square bar mentioned in the question had a shrinkage of .157 inches and therefore had a greater tendency to chill than the iron from which the castings were made that are shown in Figs. 1 to 12.

Number of Figure	Shape and Dimensions of Test Pieces.	Shrinkage per foot on Thick Edge.	Shrinkage per foot on Thin Edge.	Convex bend per foot at Thick Edge.	Concave bend per foot at Thin Edge.	Ratio Cubic inches Contents divided by Square inch Cooling Surface.
1		.109″	.133″	.025″	.011″	.156
2		.110″		.012″	0	.161
3		.116″	.124″	.025″	.011″	.104
4		.127″	.135″	.010″	.005″	.113
5		.114″		0	0	.166
6		.134″	.135″	0	0	.060
7		.121″				.125
8		.140″				.041

The final shape of the casting depends upon the time that it takes for the thin portion of the casting to become solid. Some iron has a tendency to become solid quickly, while other iron will remain fluid a longer time. If one part of a casting is very much thinner than another part, the thin part will become solid, while the thick part is fluid. With non-chilling iron or where the change of shape is gradual, the heat from the heavy part may be transferred so rapidly to the thin part that the thin part will not become solid much before the thick part.

FIG. 9

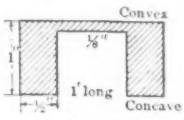


FIG. 10

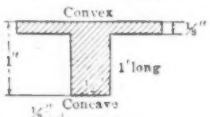


FIG. 11

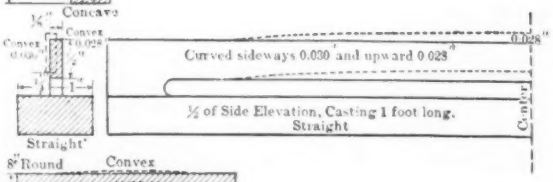
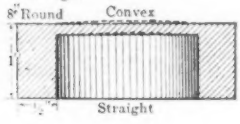


FIG. 12



In Figs. 1 to 4 the thick side of the castings were convex, showing that the thin edges received enough heat from the thick edge to allow all to shrink together. The thin part shrinking most pulled the thick side convex, the same as tightening the string of a bow.

The sharp edges of Figs. 1 and 3 were curved back and forth sideways slightly. In Fig. 11 the thin part is connected to the thick part only at the ends and cannot therefore receive heat from the thick portion. In Figs. 9, 10 and 12 the thin portions are so thin that they became solid, while the thick parts were fluid. The portion of the casting which is ⅛ inch thick became crystalline in one minute and in five minutes the shrinkage was .068 inch per foot. At this time the thick portion became crystalline and began to shrink. In becoming cold the thick part would shrink .114 inch, while the thin part would complete the remaining .068 inch. This left the thin part .046 inch longer per foot than the thick part, and it became convex. In Fig. 11 the thin part been removed and the surface uncovered as soon as the pipe was solid, that the increased shrinkage of the thin side would have slightly concaved it.

There is no contradiction in the variation in the shape of castings under different conditions of solidification. In every case a thin casting shrinks more than a thicker casting from the same iron.

The Connersville Blower Co., of Connersville, Ind., advise us that they have just completed what is claimed to be the model foundry of their section of the country. It has twice the capacity of the old one burned some time ago, is a steel structure, brick lined, and its arrangement and equipment are such as to furnish the maximum of convenience.

In New Quarters.

The attached sign greets the visitor who enters 544 & 546 West 22d st., New York City. Located close to terminal facilities in their new quarters, it is needless to say T. P. Kelly & Co. are in a better position than ever to supply all demands made upon them.

544 T. P. KELLY & CO., 546
Imported and Domestic Plumbagos and Graphites.
Foundry Equipments. Foundry Supplies. Etc.

curved both away and sideways from the thick part. In Fig. 12 it bulged up, and in Figs. 9 and 10 the casting bent, leaving the thick side concave.

As the iron used for the castings described in the question had a tendency to chill, the thin edge became solid while the thick side was fluid, and the thick side was concave; but with the non-chilling iron used in Figs. 1 to 4 the thin edge remained fluid so long that both sides shrunk together, and the greater shrinkage of the thin edge caused the thick edge to be convex.

A short time ago I had a pipe made 9 feet long and 4½ inches diameter, and purposely set the core to make one side ¼ inch thick and the other ½ inch thick. The iron was non-chilling, and the pipe was straight. If the thin side had been made ⅛ inch and the thick side ⅝ inch, or if chilling iron had been used, the thin side would have become solid so soon that it would have been convex. I presume if the core of the pipe had

---

Since war operations have begun, the Wells Light Manufacturing Co., 44 and 46 Washington st., New York, have been busy making shipments of their lights to various places to meet the needs for brilliant and efficient illumination at fortifications, for coast line defence, etc., etc., which they completely fill. This company has also made a large consignment of their lights to Cuba within the past few days, as the Wells light has proven itself to be one of the very necessary outfits of war.

THE FOUNDRY is sowing ideas and thoughts that will bear fruit in years to come.

STERNE BROS.,
Machinists and Founders.
San Diego, Cal.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.

Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

WANTED—Copy of THE FOUNDRY for January, 1898. Address R. Centner Fils, care THE FOUNDRY.

WANTED—An expert enameller on cast iron bath tubs, sinks, etc. Reply, giving particulars, to Box 150, care THE FOUNDRY.

WANTED.—Addresses of foundries that can furnish us columns, lintels, etc., at bed rock prices and inspective quality. Beckwith & Reeves, 290 Broadway N. Y.

BELL FOUNDRY business for sale; oldest in the country. Established by Paul Revere, 1795. Full particulars of George H. Lane, Bay State Brass Foundry, Boston, Mass.

FOR SALE OR EXCHANGE—Small foundry, fully equipped and doing a good business in a town of 50,000 inhabitants. For particulars address Eagle Foundry, 200 W. Exchange st., Akron, O.

WANTED—Foreman for a foundry doing a general line of jobbing work, employing from 15 to 30 molders. State your age, experience and salary expected. Address "Change," Box 157, care THE FOUNDRY.

TO LET—IN Massachusetts, a foundry 36x60 ft.; 5-ton cupola. Owner will take 100 tons of castings per year. Great chance for young man with small capital. Address "Owner," Box 151, care THE FOUNDRY.

SALESMAN—A foundry foreman with an extensive acquaintance throughout the country, desires to travel for a foundry equipment and supply house. Good salesman. Highest references. Address "Salesman," Box 148, care THE FOUNDRY.

WANTED—Situation as brass foundry foreman. Have had twelve years' experience on both light and heavy castings and can come well recommended as to my ability in mixing metals and handling men. Address, "BRASS," Box 97, care THE FOUNDRY.

FOUNDRY FOREMAN—A bright young man, 31 years old, pattern maker and molder, would like to take charge of foundry employing molding machines. Capable of laying out work and superintending same. Address "Machine," Box 158, care THE FOUNDRY.

WANTED—Position as foundry foreman. Able to produce light and heavy castings up to 40 tons. Experienced in handling men, mixing and melting iron, and up-to-date practice in general. Temperate and reliable. Address "Position," Box 154, care THE FOUNDRY.

WANTED—A position as foundry foreman of a small shop by a young man of good and industrious habits. A first-class mechanic. Can furnish the best of reference. One with wide experience in railroad and Corliss engine work. Will act as assistant in a large shop. Address "Mechanic," Box 152, care THE FOUNDRY.

WANTED—Position by present manager of large foundry and machine shop; thoroughly familiar with getting up drawings, figuring estimates, securing orders and taking charge of office work and business in general. Best of references and reasons for desiring change. Address "Manager," Box 153, care THE FOUNDRY.

WANTED—Position as superintendent or foreman of foundry. Have had a large experience on all classes of foundry work; engine castings, locomotive and car castings, also car wheels and chilled castings of all descriptions. Satisfactory references furnished upon application. Address "Superintendent," Box 147, care THE FOUNDRY.

FOUNDRY FOREMAN WANTED.—A sober, industrious mechanic, wanted by Stove Co. in Indiana. A foreman that knows how to mold good castings, and will see good castings are turned out, and can handle men to good advantage. State if married, your age, salary wanted, and reference you can furnish. Address "Central," Box 142, care THE FOUNDRY.

FOR SALE—A foundry and machine shop situated in Phillipsburg, N. J., on the banks of the Delaware river directly opposite the city of Easton; business established in 1872; capacity of foundry 8 tons per day; machine shop equipped with modern tools and patterns; lot fronts on Pennsylvania R. R., 180x264 feet deep; Shop makes a specialty of manufacturing the Telegraph Fodder Cutter. Address Vulcan Iron Works, Phillipsburg, N. J.

The S. Obermayer Company...

THE LARGEST AND MOST RELIABLE FOUNDRY SUPPLY HOUSE IN THE WORLD

CINCINNATI, OHIO
CHICAGO, ILL.
LARIMER, PA.

WE MANUFACTURE THE

BEST Foundry Facings and Foundry Supplies

EVERYTHING we ship, we guarantee to give the best satisfaction or ask no pay.

BEST PLUMBAGO
SILVER LEAD
GRAPHITE

BITUMINOUS
To mix with the Sand.
CHARCOAL
For Dusting, Wet Blacking, and Brass Work.
ANTHRACITE
For Dusting and Blacking Large Cores.
GERMAN BLACK LEAD
For Very Heavy Machinery and Loam Work.
X MINERAL
For Light and Heavy Machinery and General Work.
XX MINERAL
For Car Wheels and Heavy Machinery.
SOAPSTONE
For Stove Plate and Light Castings.
RICH CEYLON, or SILVER LEAD
For Loam Work and Piano Plate.
STOVE PLATE FACING
For Stoves, Sinks and Hardware.
PIPE BLACKING
For Blacking Pipe Cores.

WE MANUFACTURE

Fifty other reliable brands of FACINGS and it would be no trouble to express you samples if you tell us the purpose for which they are to be used. . . . . .

Heavy Fire Proof, Return Facings and Plumbago—Specialties.

MOLDING SILICA . . CORE . . . **Sand** FOUNDRY EQUIPMENT IN GENERAL.

J. W. PAXSON CO. ✳ Pier 45 North, PHILADELPHIA, PA.

A Word

as to

Joseph Dixon Invented the Plumbago Crucible

DATE OF INVENTION
1826.

Dixon's Crucibles have been in the Market SEVENTY YEARS.

Dixon's Plumbago Crucibles

Dixon's Crucibles are Standard all over the **GLOBE.**
Dixon's Crucibles are used in every country on the Globe where metals are melted.
Dixon's Crucibles have the highest records for **HEATS.**
Dixon's Crucibles are made to get

BEST RESULTS WITH THE LEAST COAL.

Dixon's Crucibles are made of many mixtures to suit all kinds of work.
Dixon's Crucibles are made special for Steel Melting.
Dixon's Crucibles are made special for Nickel Melting.
Dixon's Crucibles are made special for Brass Melting.
Dixon's Crucibles are made special for Composition Melting.
Dixon's Crucibles are made special for Phosphor Bronze Melting.
Dixon's Crucibles are made special for German Silver Melting.
Dixon's Crucibles are made special for the Melting of Precious Metals.

In ordering you will be benefitted by mentioning the kind of Metals melted. Write for pamphlet **"How to Use Plumbago Crucibles."** The best are the cheapest, as they must stand the punishment of high heat and much wear and tear. The "Dixon" records in average efficiency, in general good behaviour and in volume of sales, far in the lead.

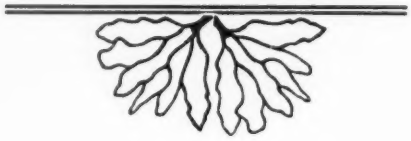
Jos. Dixon Crucible Company,

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

537=39 West 27th St.,
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY, N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.

Established 1872. Incorporated 1895.

McCullough-Dalzell Company

PITTSBURGH, PA.

CRUCIBLES for Brass Melting .
CRUCIBLES for Steel Melting .
CRUCIBLES for All Purposes . .
CRUCIBLES of All Sizes . . .
STOPPERS, Twenty-one Styles .
LIDS, COVERS, CAPS, . . .
PHOSPHORIZERS . . . .
PLUMBAGO FINE DUST . . .

ALL
ARTICLES
CONTAINING
PLUMBAGO

Crucible.

ROBT. J. TAYLOR & SON

COR. 19th & CALLOWHILL ST. PHILA.

TRADE MARK.

Crucible

Dipper.

Cover.

Stopper.

Crucibles

For melting Steel, Brass, Copper, Gold, Silver, Nickel and Metals and Alloys of Every Description; SmallCrucibles for making Assays and fine pure Plumbago for lubricating, etc.

We are practical workmen and have studied the requirements of the different metal works in this country, as well as in Europe. We also work strictly by chemical analysis, giving a uniformity at all times never before approached in this or any other country.

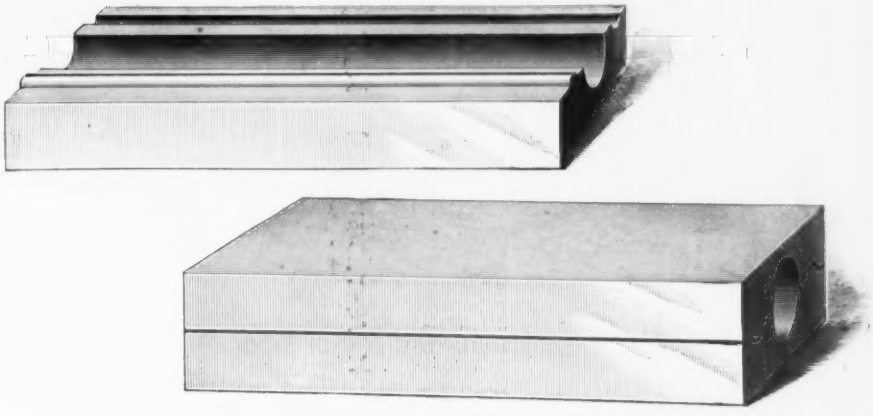
We make All Sizes, from 8 oz. to 2 ton Capacity.

ROBT. J. TAYLOR & SON,

1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

The Cleveland Facing Mill Co.

PERFECTION CORE BOX



WILL SAVE YOU MONEY.

It is accurate, being absolutely correct as to measurement; durable, being made of hard seasoned maple; cheap, as a hard wood box can be procured for less money than you can make a pine box for; it is superior to a pin-jointed box as joint is continuous its entire length, thus avoiding side motion. No dowel pins to break off. No holes to clean out. Shifting boxes endwise serves to loosen cores, consequently no rapping. Sold by the foot and you can cut it up, or by the box. Write for price list and discount. Hundreds of feet sold.

..... OUR .....

AA Ceylon Plumbago and C.F.M. Founders Perfect Wash

TURN OUT THE BEST CASTINGS.

We can prove it with a free sample, which we are glad to send for the asking.

FOUNDRY FACINGS,
FOUNDRY BLACKINGS,
FOUNDRY SUPPLIES.

THE CLEVELAND FACING MILL CO.

CLEVELAND, OHIO.

P. C. COCHRAN, PRESIDENT.
J. H. WURTZ, SECRETARY.

J. R. LAUGHREY, TREASURER.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. 3500 Tons Daily Capacity.

300 30-TON GONDOLA CARS — 50 30-TON COKE CARS.

Shipments of Coal commenced November 23 1893.
" Coke " August 29, 1894.

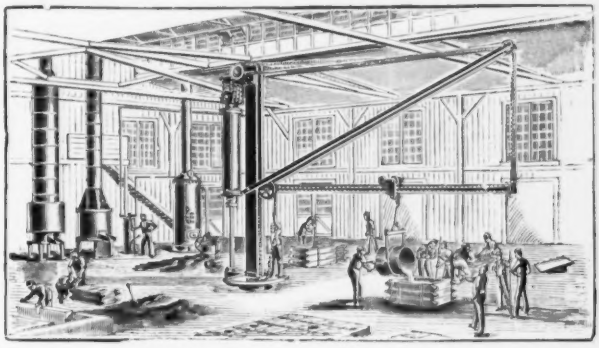
Coal shipped during	1893	3,750 Tons.
Coal and Coke shipped during	1894	204,500 "
" " "	1895	370,000 "
" " "	1896	353,000 "
" " "	1897	750,000 "

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

50% More Work for Same Wages

"Phew! Ridgway, that's putting it mighty strong, isn't it?" Well, it is either true or it is not true. If it is true, you certainly ought to want to know it and it will not take you long to find out. We have literature giving some of the establishments which are using Ridgway Cranes and there are Railroads and the United States Government has an excellent postal service, so there will be no trouble for you to thoroughly investigate the matter.



5-ton Steam-Hydraulic Crane in a Foundry.

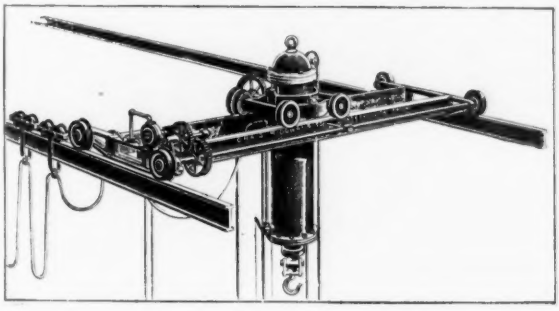
Indeed, the fact that the best plants, Foundries, Steel Works, etc., all over the country are putting in these Cranes as fast as we can build them, should stir your interest in the machine.

What is there about this crane that makes the people who get them so enthusiastic over them? They don't talk this way and write such letters about other cranes. For example, here is a letter from the President himself of one of the largest steel plants in the United States. You can judge its size when they employ 3,000 men. Of course, we can't print the name here—he wouldn't like it. We'll tell you privately if you care to know. But here is what he says:

> "It gives me pleasure to state that the Ridgway cranes which we have in operation at our works have given us entire satisfaction. *Where medium and light weights* [under 25 tons] *have to be handled, I do not know of any type of crane that equals them.*
>
> Yours truly,
>
> —— ——, Pres., —— Steel Co.

As his concern uses all sorts of cranes, he ought to know which is best.

Air Hoists. Foolin' Away



your money to buy any other sort. Get just one and try it for yourself and you'll see. Does the most delicate foundry work. No jerk. A little oil in the piston rod makes it the best Air Hoist ever made. Best shops are getting them. None carried in stock. Can't make them fast enough.

"PLEASE TAKE THE ELEVATOR."

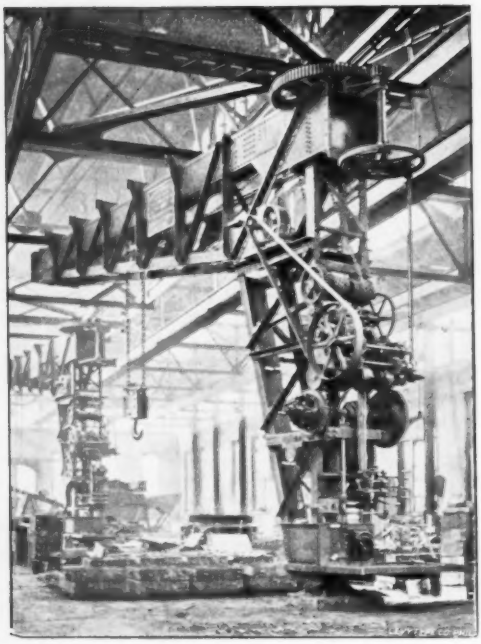
We're Proud of This Machine. You'll be, too.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



In connection with our Machine Tool Business, we conduct a large foundry where practical tests are continually made of new labor-saving devices. The manufacture of

IMPROVED FOUNDRY CRANES

has become an important feature.

This illustration shows a . . . . . .

Quick-Acting Electric Jib Crane

built by us and erected in the foundry of the Baldwin Locomotive Works. A similar crane in process of erection appears in the background.

Centrifugal Sand Mixer

Since the introduction and favorable reception of this effective, expeditious and economical **machine for preparing sand for molds and cores** we have simplified its construction and cheapened its cost. The capacity of the machine is remarkable, being limited only by the facilities for feeding sand into the hopper. Two men will easily shovel 5 tons an hour into the machine.

The qualities of "toughness" and "porosity" are materially improved by this process of preparing molding sand.

Twenty-six Feet Long, Thirteen Feet Wide, Three and One-half Feet Deep, 46,000 Pounds Weight . . . . . .

That is the dimensions of a casting made in our No. 4 Zanesville sand by the Excelsior Foundry Co., of West Bay City, Mich. There is cheaper sand closer to these people, but it is not wanted by those who understand their business. Good foundry management does not consist in using the cheapest. Here is what this company says:

"On Dec. 28th, 1897, we cast in your No. 4 sand, the largest casting in size, not weight, ever made on the lakes, if not in the country, being 26 ft. long, 13 ft. wide and 3½ ft. deep, and weighing nearly 46,000 lbs. It is a perfect casting in every respect and was made in green sand."

Ain't that a whopper? And made in green sand at that. We have said that good molding sand is the foundation for good castings. We repeat it now. When you have to pour 23 tons of iron in a hole in the ground you want sand that will hold it up. Our No. 4 for heavy work—well, you see what the Excelsior Foundry Co. say—Great ad. for them—Good enough ad.—for us too. We don't ask you to take our word for the claims we make. Ask our customers:

Oh, yes.—We came nearly forgetting to tell you, that we handle other sands besides No. 4.—We have sand for all classes of molding; we do nothing but handle sand, it is our specialty.—You know the specialist is the man nowadays.

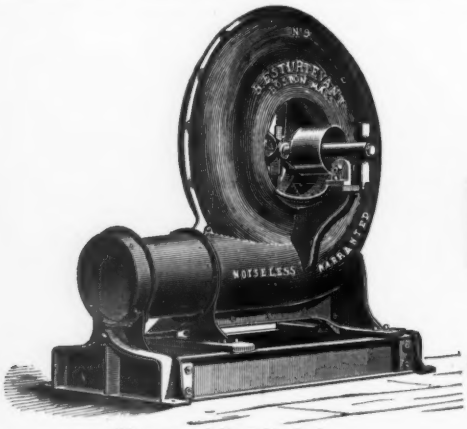
Yours truly,

AYERS, the Sand Man.

ZANESVILLE, OHIO.

If you are closer to Chicago than Zanesville consult our Western man.

H. S. VROOMAN, 220 W. 20th St., CHICAGO.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

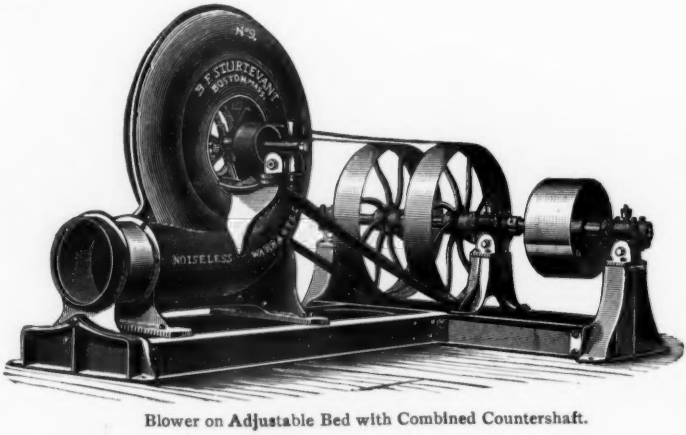
—FOR—

Cupola Furnaces and Forge Fires.

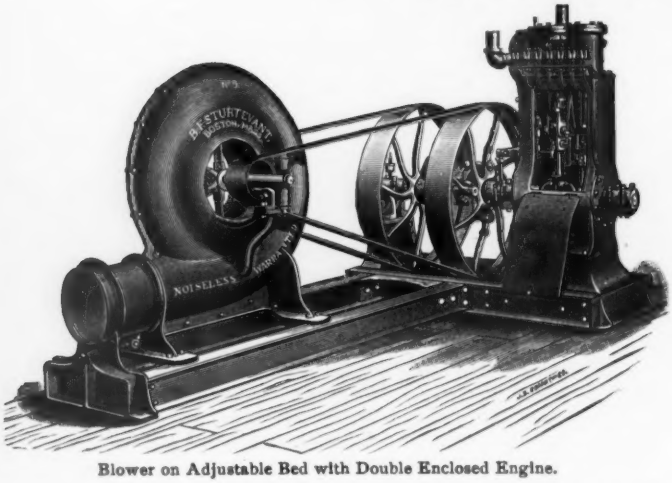
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

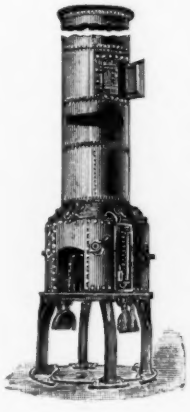
B. F. STURTEVANT CO.,

BOSTON, MASS.

131 Liberty Street, NEW YORK. 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.

A BARGAIN IN CUPOLAS



A few years ago a large plant was erected in Detroit by a concern which intended to manufacture car wheels and car equipment. It was never put into operation. Two Colliau cupolas were purchased for this plant. One of these was erected, but never used; in fact, it was never lined even. The other remains just as it left the manufacturer's hands.

These cupolas have a shell 75 inches in diameter and the height from bottom plate to top of stack is 40 feet.

They have been well taken care of and stored in a suitable place and are in as perfect condition as when purchased.

The Colliau cupola has never been excelled as an economical melter, as is shown by the large number in use and the imitations which have been made of its construction.

The chance to obtain good cupolas at half price is not an everyday occurrence. We will sell these below any price a manufacturer could possibly make.

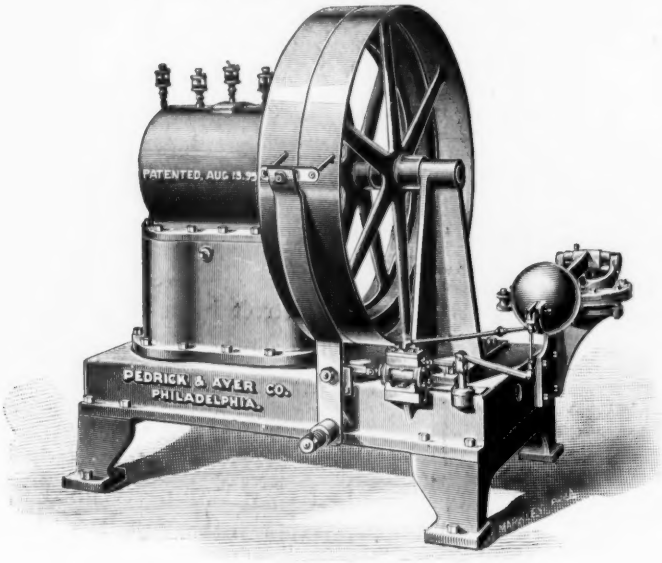
We also offer for sale a number of cupola bricks, made expressly for these cupolas. Price of both quoted upon application.

F. T. DeLONG,

93 Griswold Street, DETROIT, MICH.

Automatic Compound Belt Air Compressors.

PATENTED AUGUST 13TH 1895.



Straight Lift Hoist. **Built in two sizes, Nos. 1 and 2.**

No.	Size of Cylinders in Inches	Revolutions per Minute.	Cubic Feet of Free Air	Horse Power Required.	Size of Pulleys in inches	Shipping Weight of Compressor	Floor Space in inches	Telegraphic Symbol
1	11x 6 6x 6	100-160	32- 50	2-3½	40x5	2875 lbs.	60x40	Parian
2	1:x10 8x10	90-120	90-120	9-15	60x6	5370 lbs.	76x60	Parish

HORIZONTAL HOIST.
PAT. SEPT. 4TH 1894.

AIR HOSE COUPLING
For ½ inch, ¾ inch and 1 inch Hose.

These Compressors will compress more air at less cost than any other make, requiring no attention other than oiling; entirely automatic in action, stopping and starting as air is required. Specially adapted for foundry use. Can be run in series, if so, no stoppage impossible.

Horizontal Air Lift for low ceilings; for general lifting, quick in action and under perfect control of operator.

Straight Air Lift for foundry purposes when equipped with retaining and releasing valve, will hold the load whether heavy or light, in the desired position, as in case of lifting a ladle of molten iron and pouring it or raising a flask to knock out the sand. It can neither ascend or decend as long as connected to air supply.

Air Hose Couplings are designed to do away with long lines of hose. By having suspended along the air line a number of hose equipped with this device, connections can instantly be made or disconnected, allowing one hoist to serve in several places. Each size made in duplicate. Containing a shut-off valve.

Send for circulars and details to Pedrick & Ayer Co., Pneumatic Department.

PEDRICK & AYER CO.

SPRING GARDEN STATION, PHILADELPHIA, PA.

Manning, Maxwell & Moore, *Sole Agents,* 111-113 Liberty St., New York City. 60 South Canal St., CHICAGO, ILL. 424 Telephone Bldg., PITTSBURG.

FACTS AND EXAMPLES

All of these cores have been cast successfully without venting, when made with the Holland Core Compound.

GEBRÜDER SULZER
WINTERTHUR & LUDWIGSHAFEN a./RH.

Telegramm-Adresse
GEBSULZER WINTERTHUR.

Winterthur, den 9th Nov. 1897.
(Switzerland)

THE HOLLAND LINSEED OIL CO.
683 Austin Ave., Chicago, U. S. A.

GENTLEMEN—Your Core Compound sent on Oct. 6th has arrived. The results were to our entire satisfaction and we beg to ask now prices for a few barrels, say: one or two tons of same f. o. b. New York. Payment against bill of lading. In case the Compound should cost too much freight, we beg to ask if you would be inclined to give us the composition of same against payment of a certain royalty.

Let us know your determination as soon as possible and believe us,

Yours truly,

Gebruder Sulzer.

We find that the Holland Core Compound *works better* than the oil we have been using and *gives off less gas.* We use one pint of oil to twenty quarts of sand and it makes a nice smooth core. We have used it on Water Heater Cores, Water Back Cores, etc. We find it is not necessary to vent.

ABENDROTH BROS.
Port Chester, N. Y.

We have used the Holland Core Compound for the last three months with excellent results in cores for cylinders, from the smallest size to eight inches in diameter. We have *not found it necessary to use vent wires* in order to carry off the gas in making above cores.

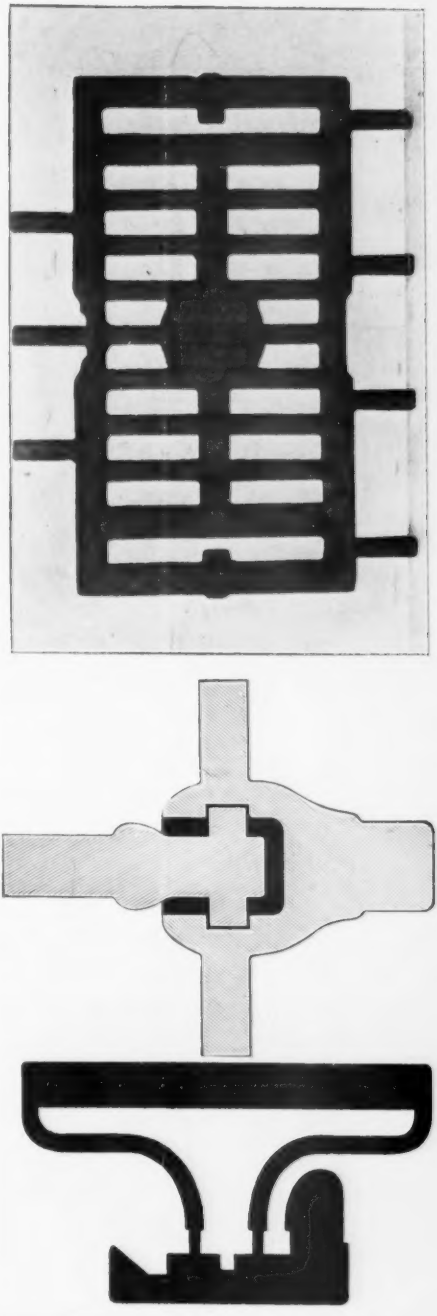
Proportion used—thirty parts sand to one compound, mixed well and tempered with water to suit.

THE SNOW STEAM PUMP WKS.,
Buffalo, N. Y.

I have used a good many different core compounds while I was in charge of different shops in the States, but must say I have never used any that gives as good satisfaction as yours has given us. Yours truly,

W. H. FONDA,
Supt. of Foundry Dept., of Rhodes, Curry & Co., Ltd., Amherst, N. S.

We have just issued a booklet on "Cores and Coremaking." It contains many new facts. You can have one for the asking.



HOLLAND LINSEED OIL CO. 683 Austin Avenue, CHICAGO

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO, ILL.

There are Two Kinds of

ROTARY PRESSURE

BLOWERS

THE ROOTS

AND OTHERS

OUR BLOWERS . . . . .

represent all the "up-to-date" ideas and embody (what no other . . . . blower can) forty years of experience in the construction of this type of machine . . . . . .

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

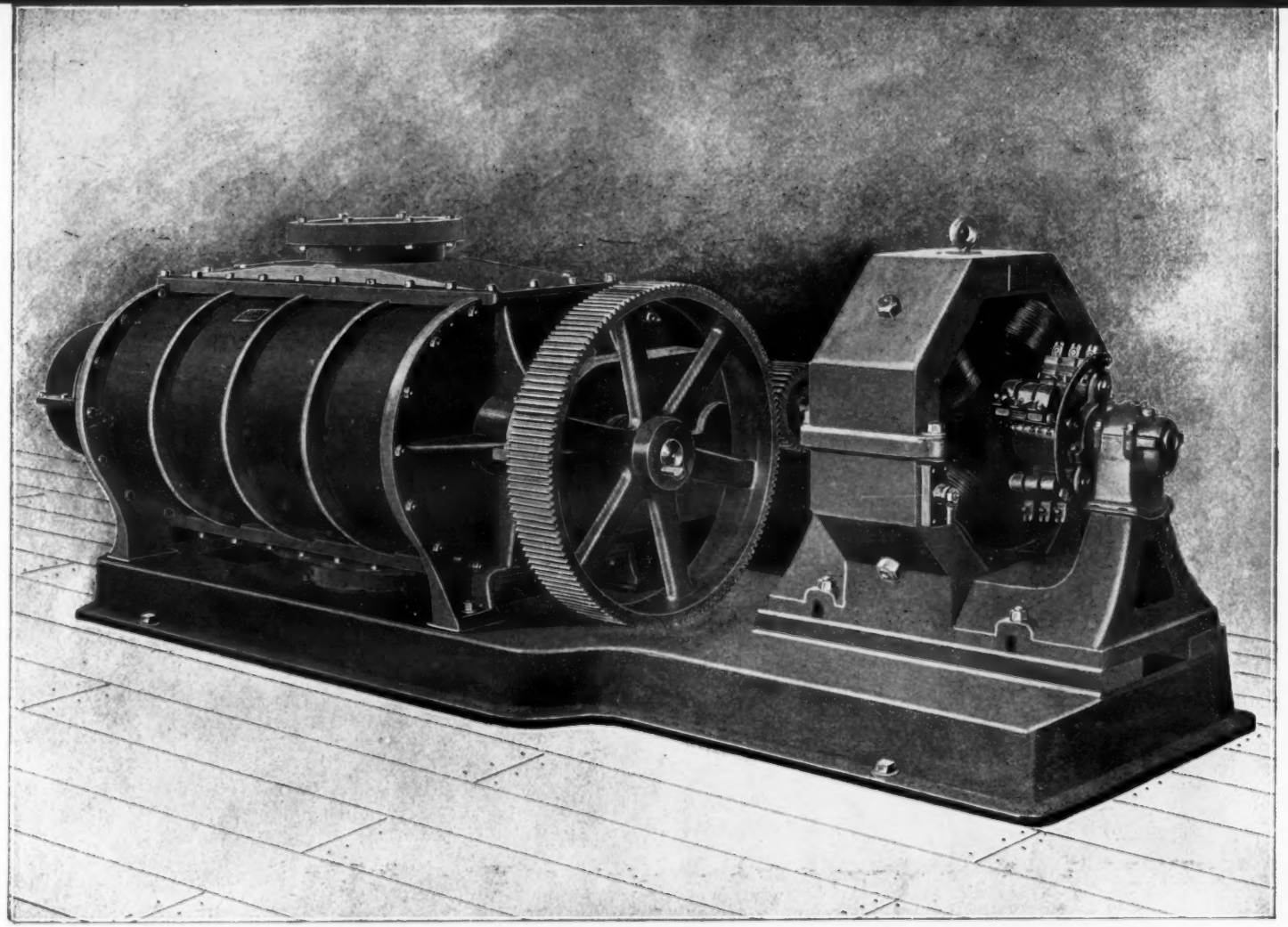
P. H. & F. M. ROOTS CO.,

109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

VANDERGRIFT BLDG., PITTSBURG, PA.

AND AMERICAN GAS COMPANY,

222 South Third Street, PHILADELPHIA, PA.



ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

Testi= monials.

It is an old saying that testimonials can be had for anything.

The SMOOTH ON Compound, for curing defective castings, is an exception to this rule. We have no testimonials for it and don't expect any.

This is not because SMOOTH ON does not give satisfaction. If such were the case there would be plenty of people to talk about us.

When a foundryman hauls a leaky casting out of the scrap heap, gives it a dose of SMOOTH ON, and disposes of it as a perfect casting, he is not going to talk about it, is he?

Not on your life.'

Do you believe there is a foundryman who would tell you that he saved the greatest portion of his scrap pile, by filling defective parts of castings with SMOOTH ON? No, my son, that kind of foundrymen are as scarce as honest men in Congress.

Do you think for a moment that he is going to give his neighbors a chance to talk?

He is going to saw wood. Nobody knows the difference between a perfect casting and one made perfect by SMOOTH ON. SMOOTH ON never gives him away. It is a great sticker. It stays with the casting till it is worn out. It is the greatest friend the foundryman ever had.

Who uses this compound? My boy, like the girl said when remonstrated with for flirting: "They all do it."

Who wouldn't save his work if he could? Honest, now, if you could make a bad casting as good as the goodest, and nobody would ever know that you had doctored it, wouldn't you do it?

That is just what you can do with SMOOTH ON. Make the best castings you can, that is right, but you are helping yourself and hurting nobody by saving what you can. A small dose of SMOOTH ON will cure a bad casting and help you straighten things out.

If you try it once you will never talk about it. SMOOTH ON is one of the good things that is not pushed along. It is so good that the foundryman who gets it would keep it all to himself, if he could.

We will tell you from time to time how to hold your scrap pile down. Meanwhile write for samples of SMOOTH ON and try it.

SMOOTH ON MFG. CO., VREELAND TOMPKINS, MGR.
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DIRECTORY OF LEADING PIG IRON DEALERS.

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CLINTON INSPECTED FOUNDRY IRON
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SUPERIOR CHARCOAL IRON COMPANY,
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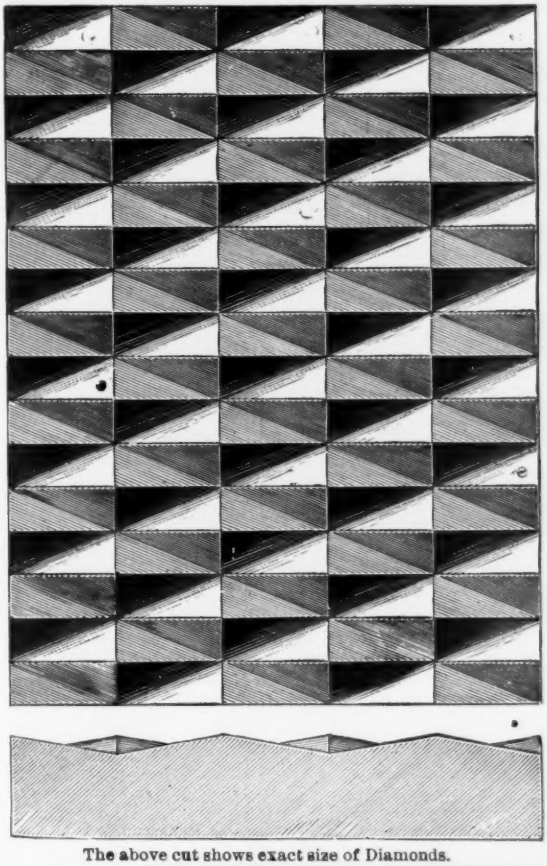


Diamond Pattern Lumber,

—FOR—

DOOR SILLS, PLATFORMS, STEP PLATES, Etc.

This Patent Lumber is made by a Special Machine invented by us, the ONLY Machine of its kind, and each piece will match PERFECTLY with all other pieces, by "joining" the edges to the centre, lengthwise, or any row of Diamonds.

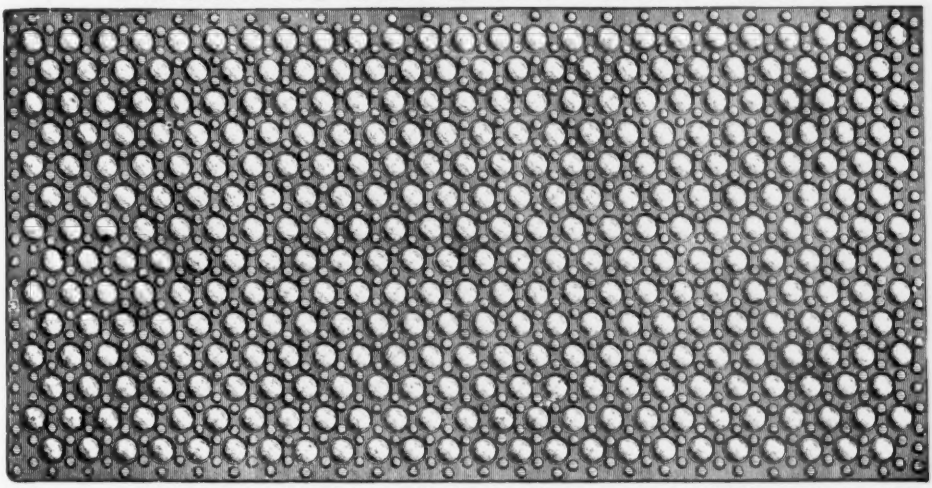
Size of each piece, 8 feet long by 6 inches wide and ¼ inch thick. Price 10 cents per running foot of 6 inches in width, NET CASH crated and delivered f. o. b. Chicago, in orders of not less than 6 pieces. Send for sample.

BROWN BROS. MFG. CO.

Cor. Clinton and Jackson Sts. Chicago.

The above cut shows exact size of Diamonds.

PRISMATIC SIDEWALK LIGHT TILE.



Make your own frames and we will furnish you with Tiles for either Iron or Concrete Lights. Write for prices.

BROWN BROS. MFG. CO.,

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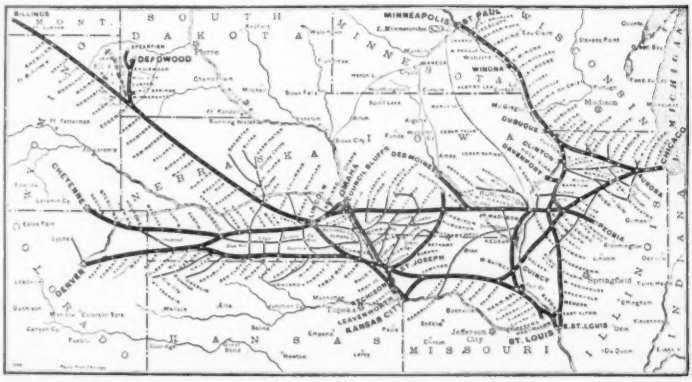
Burlington Route

A WORD TO MANUFACTURERS

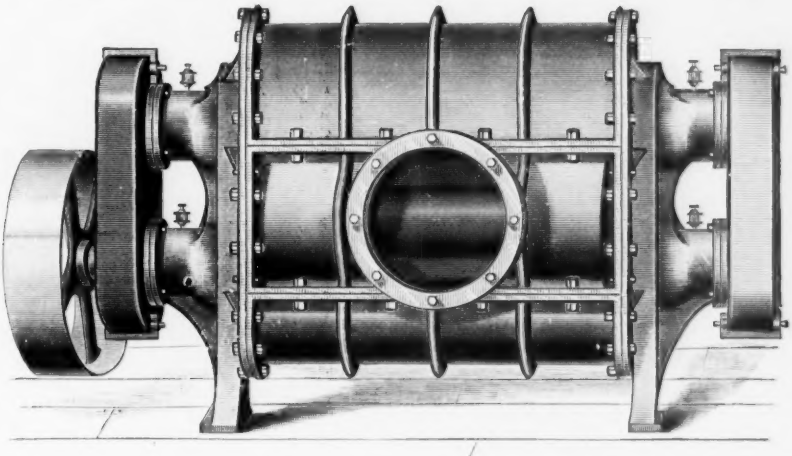
The Industrial Department of the Chicago, Burlington & Quincy Railroad is organized for the purpose of aiding in the location of factories along the line of this road. No section of the country has greater resources to attract the manufacturer. Cheap coal and an abundance of raw material. Many cities on our line offer liberal inducements to aid in establishing new plants.

We solicit correspondence, and will assist manufacturers seeking a new location in every way possible. *GEO. H. ROSS, Superintendent,*
209 Adams St., CHICAGO, ILL.



A MAP OF THE BURLINGTON ROUTE — ITS 7500 MILES OF ROAD REACH EVERY IMPORTANT CITY BETWEEN THE GREAT LAKES AND THE ROCKY MOUNTAINS.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

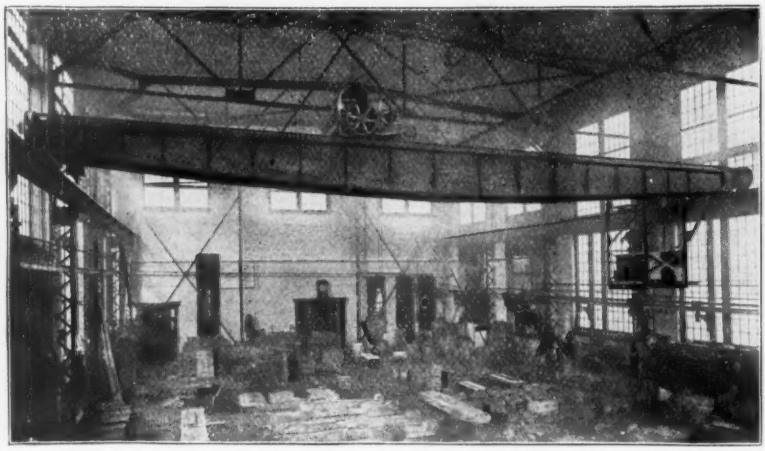
Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co.,

2518 Frankford Ave., PHILADELPHIA, PA.

Three Motor Electric or Compressed Air Traveling Cranes



ELECTRIC THREE MOTOR TRAVELER, 50-FOOT SPAN.

Modern Cranes are necessary to produce work economically.

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THE LEADING FOUNDRIES USE THE WHITING CUPOLA.

Made in 14 Sizes.

COMPLETE FOUNDRY EQUIPMENTS FURNISHED.

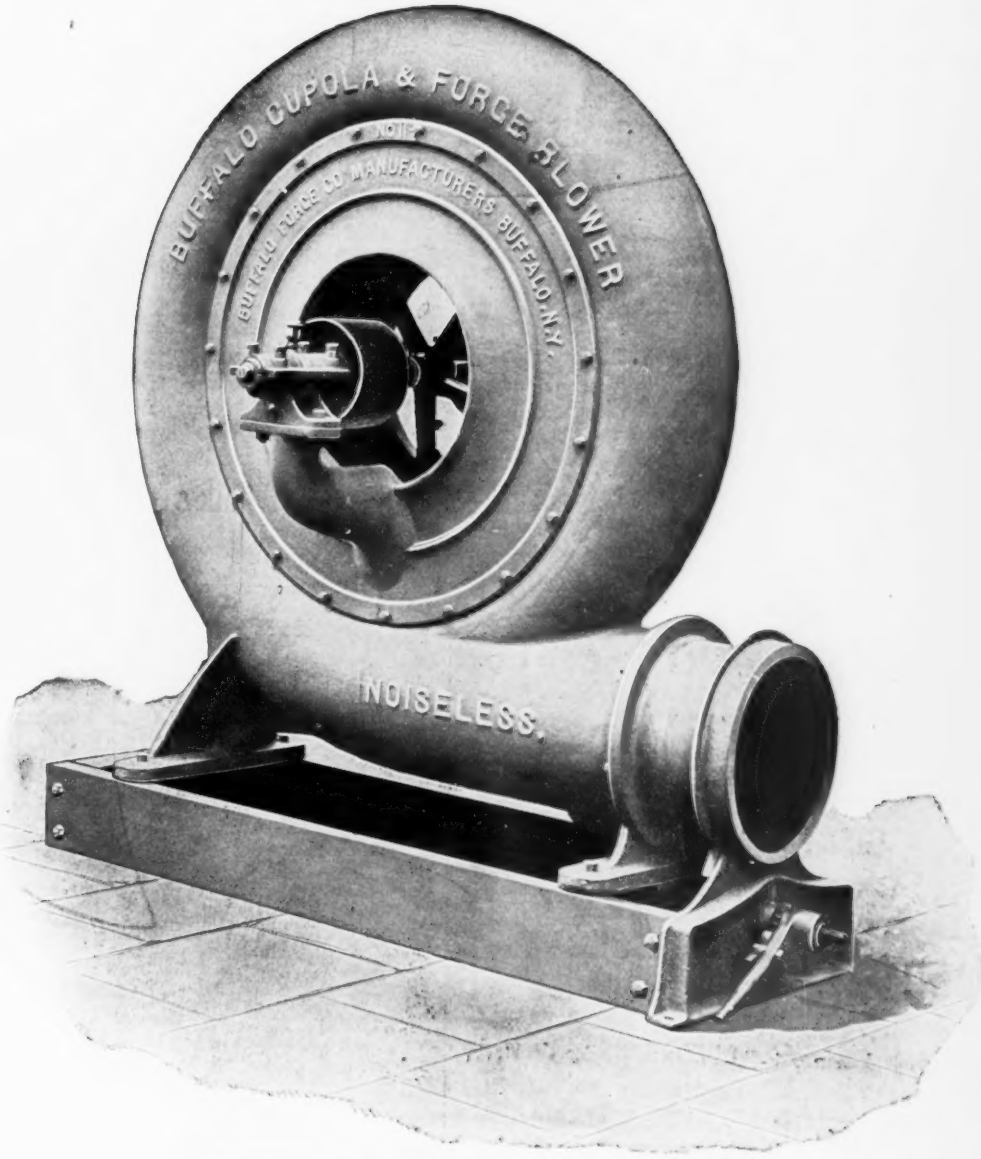
THE AVERY MOLDING MACHINE.

Prices on application.

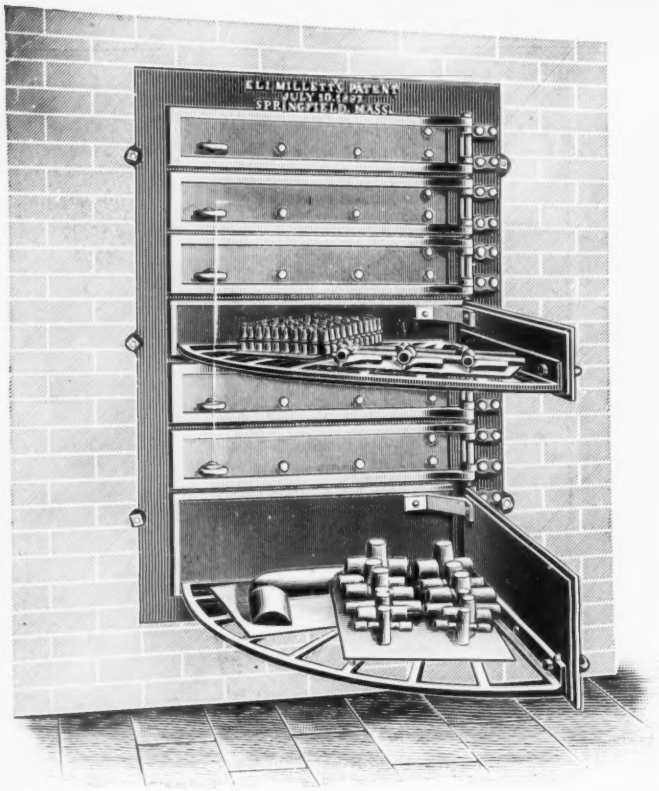
SEND FOR CATALOGUE.

Whiting Foundry Equipment Co.

Works, HARVEY, ILL. (Chicago Suburb.)



A BUFFALO BLOWER—Enough Said.



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THE BEST IN THE WORLD

No Foundry using small cores can afford to be without it.

Over one hundred and fifty in use.

Send for our new Catalogue giving names of those using them.

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"FAIR DEALING" Their Motto.

MANUFACTURERS OF

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INSPECTED FOUNDRY IRONS . . . . .

ALSO

Sole Factors for DUNBAR STRONG IRON

In New York and New England.

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NEW YORK OFFICE, No. 15 Cortlandt St.

Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

ESTABLISHED 1854.

Brooklyn Fire Brick Works

CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

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88 Van Dyke Street, BROOKLYN, N. Y.

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that is floating over the land is a good thing for foundrymen, and we are in sympathy with it . . . . . .

Our **EVERLASTING Cupola Blocks** are built on scientific principles, and for wear, they beat the band. You can make your Cupola Tender happy by lining up with the **EVERLASTING Cupola Blocks** . . . . . .

You Can't Get a Sticker

when you use Molding Sand that is scientifically selected. Sand for all classes of work. No guess work about it. Just say what kind of work you are doing, and we will send sand to suit . .

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PARLOR DOOR HANGERS.

The adjustment is in the Track and not in the Hanger, as are others.

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BARN DOOR HANGERS.

Impossible for door to jump the track. Very simple and cheap to apply.

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Recommended and adopted by fire underwriters all over the United States.

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Furnished complete with straight and curved track, switches, frog brackets, single and double carriers.

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The Universal Liquid Core Compound

Patented in the United States, England, France and Belgium.

GLUTROSE was invented and is manufactured by a practical foundryman of many years' experience, It has been used in the Pennsylvania Railroad Foundry at Altoona and other large foundries for the past three years with the most satisfactory results.

It is cheaper and better than flour, rosin, oil, molasses or any other compound in use; takes the place of all other materials and never varies in quality.

WILL MAKE FIRST-CLASS RADIATOR CORES WITHOUT RODDING.

WHY PAY 30 to 40 CENTS FOR LINSEED OIL WHEN THE SAME RESULTS CAN BE OBTAINED FOR HALF THE MONEY?

WILL NEVER BLOW THE CASTINGS.

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Sole Manufacturers.

Office: PENN MUTUAL BUILDING,

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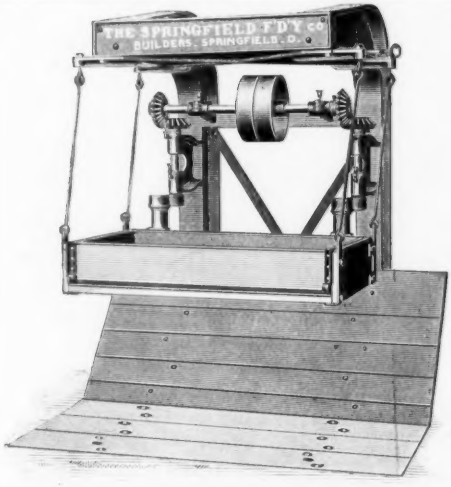

THE PERFECT

Sand Riddling Machines

BOTH HAND AND BELT POWER.

These are the Best, Simplest, Most Durable and Most Easily Operated Sand Riddling Machines made. For full particulars and references, address,

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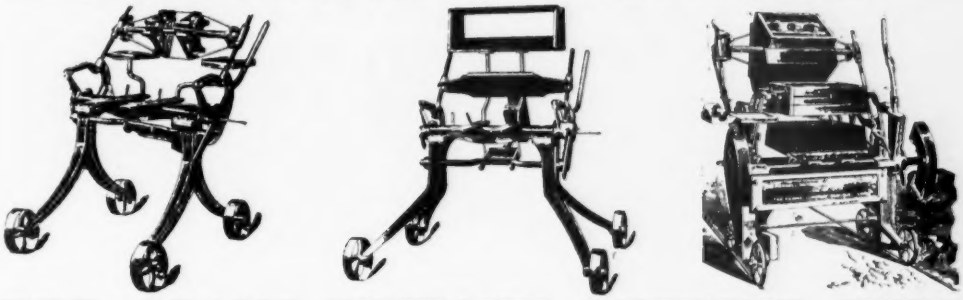

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Manufacturers of Supplies for BRASS FOUNDRIES.

<Standard> Flask.

Finished Hardware Specialties to Order.

Not milled with Emery Wheels, but accurately planed

Which is your choice. We make both styles.

ESTABLISHED 53 YEARS

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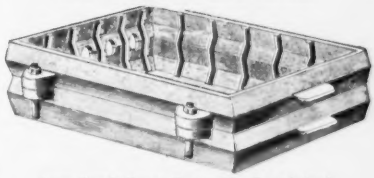

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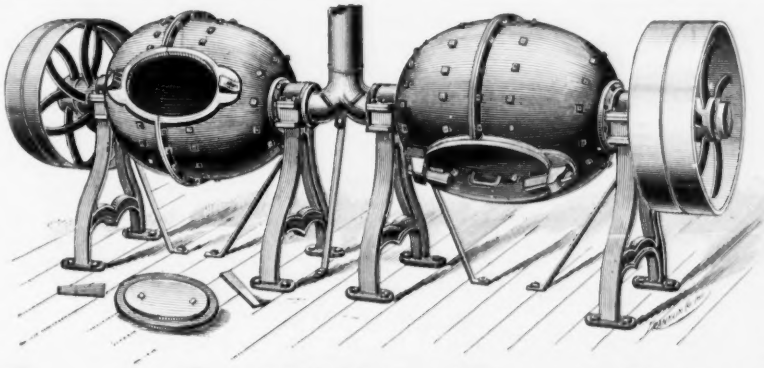

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Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does doublethe work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

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Phœnix Molding Sand

The best results are obtained by using Good Material and in calling the attention of Foundrymen to our **Phœnix Sand,** which is a superior grade for **Stove Plate, Malleable Iron** and **Light Work** and has proven entirely satisfactory, producing a smooth, bright casting, we would like to have the foundrymen become acquainted with this sand by sending for sample.

Ætna Sand and Clay Co.,

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ESTABLISHED 1845.
OFFICE OF
F. & L. KAHN & BRO.,
ESTATE STOVES AND RANGES.

HAMILTON, O., January 25, 1898.

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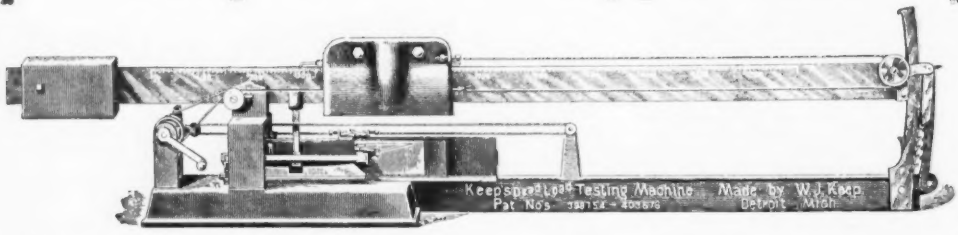
GENTLEMEN—It affords me pleasure to state that I have used in the last few months several car loads of your Phœnix Sand and I find it highly satisfactory for foundry work and especially light castings.

Yours truly,
H. V. MOORE, Supt. F. & L. Kahn & Bro.

"Keep's Test" Apparatus.



PROSPERITY consists in making money when selling castings at the present low prices.

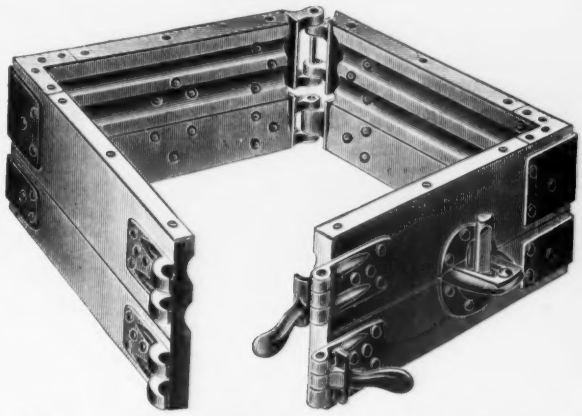
HOW? Adopt modern devices. Some save $10.00 per day in the cost of mixture by regulating silicon by . . . . . .

"KEEP'S TEST."

TO SAVE MONEY IN YOUR OWN FOUNDRY, ADDRESS **W. J. KEEP, Detroit, Mich.**

We can save you money by building your Snap Flasks.

EUREKA IMPROVED SNAP FLASK.



No. 1—Hardwood, 1¼ in. Stock, $2.75 each. No. 2—Whitewood, 1¼ in. Stock, $2.50 each.

Made of the best Kiln-Dried Lumber, Bound with Iron and All Trimmings Riveted. Write for Prices.

C. H. GREEN & CO., Syracuse, N. Y.

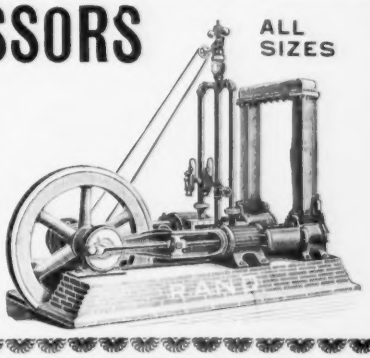
RAND AIR COMPRESSORS

FOR FOUNDRIES.

SIMPLE. DURABLE. ECONOMICAL.

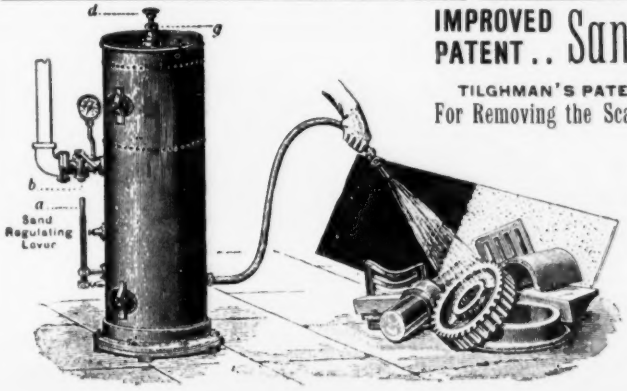
Our **Duplex Compressor,** Compound Air Cylinders, with Inter-Cooler and Compound Steam Cylinders, with Meyer Cut-off Valves, is the best construction for small and medium sizes.

ALL SIZES



RAND DRILL CO.

Don't forget our Rock Drills. 100 Broadway, NEW YORK.



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TILGHMAN'S PATENTS MATHEWSON'S PATENTS.

For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

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SOLE AGENTS,

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23-25 Purchase St., BOSTON.

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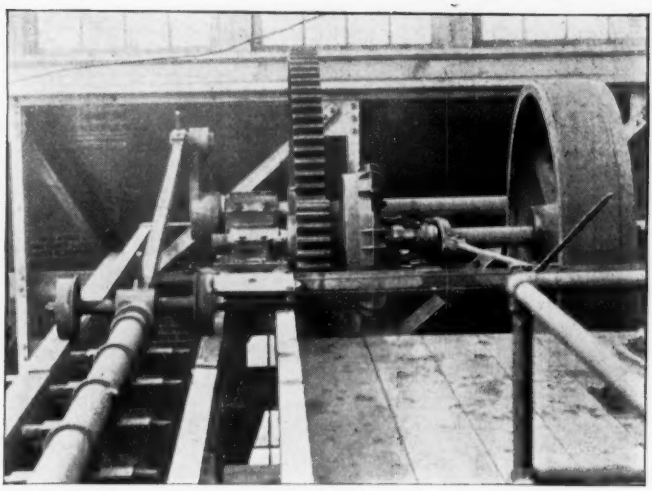
ENGINEERS AND CONTRACTORS,
PITTSBURG, PA.

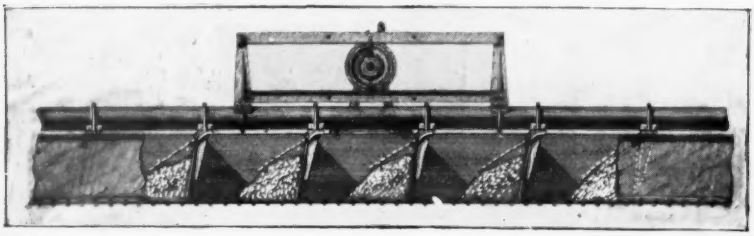
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





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Complete Installations.

AKRON TUBULAR STEEL WHEELBARROWS FOR . . FOUNDRY USE.

Re-inforced Trays

SOLID FRAME.

No Holes Drilled into it.
All Parts Clamped on.

PERFECT FORWARD DUMP.
STRONGEST, EASIEST HANDLED.
LIGHTEST AND MOST DURABLE.

McNEIL'S PATENT BALANCED AUTOMATIC DUMP CHARGING BARROW.

THE AKRON CULTIVATOR CO. MFRS.
AKRON, OHIO.

OTHERS MAY OFFER

New Fangled Substitutes for Lycopodium

BUT GOOD, OLD-FASHIONED

NEW ENGLAND CHARCOAL FACING

will do just as good work, is not injurious to inhale, and cheapest of all. The fact you have used common charcoal, that was not right, is no reason you should not try ours. We guarantee every barrel. Let us send you a sample and tell you about it.

SPRINGFIELD FACING CO., SPRINGFIELD, MASS.

A Native of Ceylon.

This is not a Plumbago Tree. It is of tropical growth and is known as the Fly Tree, from the fact that insects are lured to their death by settling in its foliage.

It makes us think that many foundrymen are drawn towards diminished profits by roosting too close to cheap plumbago.

Plumbago isn't cheap because you get it for a song, with a few drinks thrown in.

What you save in the first place on plumbago, you pay out twice later in getting your castings cleaned. If you want the lowest priced so-called plumbago, we can't help you; we haven't got it. If you want plumbago, a dollar's worth of which will go further than a dollar's worth of any other, we are the people. Kelly's is that kind of plumbago. Lots of people using it who will tell you so.

T. P. Kelly & Company, MILLS AT . . Reissing, Pa. Bloomsbury, N. J.

WESTERN OFFICE and MILLS: 284 Pearl St., NEW YORK, N. Y.
121-127 N. Ada Street, cor. Kinzie, CHICAGO.

CINCINNATI, HAMILTON & DAYTON Ry

THE SHORT LINE
BETWEEN
CINCINNATI. INDIANAPOLIS,
DAYTON, LIMA.
TOLEDO and DETROIT.
D. G. EDWARDS, Pass. Traffic Mgr., CINCINNATI, OHIO.

Infant's Underwear

and Street Car Tickets will both go into "Smith's Wallets." So will bonds and letters your wife is not supposed to read. One of these Wallets will be sent to any Firm, Manager or Foreman applying for same, when application is written upon paper containing their regular letter head. FRANCIS H. SMITH, Akron, O.

PLEASE don't forget to enclose ONE of UNCLE SAM'S STAMPS to cover cost of mailing.

A Free Discourse

ON **FIRE BRICK**
AND **MOLDING SAND**

may be a good thing, but **RESULTS** are what you want. When lining your **CUPOLA**, try . . . .

"FRANKLIN CROWN" BLOCKS.

If they don't give **RESULTS**, we will replace them **FREE OF CHARGE.**

"WIGTON STEEL" AND "SLIGO" ARE ALSO GOOD BRICK . . . . .

MENTION THE FOUNDRY.

Always Remember . . .

we are the largest dealers in the West in all grades of . .

MOLDING SAND and FOUNDRY SUPPLIES

SEND FOR OUR BOOK.

Garden City Sand Co., * * SECURITY BUILDING, CHICAGO.

WE MANUFACTURE

PLUMBAGO CRUCIBLES

FOR MEN THAT

UNDERSTAND

using them and then they cannot be surpassed in durability; 90 heats have been attained from one crucible. Send for testimonials, quantity and sizes wanted, and we will quote you figures.

Ceylon Plumbago

PURE and HEAVY, is the only material for FACINGS if you want a bright smooth casting or for a Lubricant or Stove Polish, etc.

We keep it for sale.

Hussman Crucible Co.

ST. LOUIS, MO.

Eberhardt's Patented Sprue or Gate Cutter

Dear Sir:—The machine fills the bill; am just delighted with it.
Yours truly,
Maryland Brass & Metal Works,
Baltimore, Md.

Price Low

Send to

GOULD & EBERHARDT, NEWARK, N. J.

Bicycles as a Side Line.

STEARNS BICYCLES

Bicycles make an admirable Side Line for the Stove and Hardware . . . Trade. STEARNS BICYCLES particularly so, for they are well advertised, universally known, up-to-date and stylish and the discounts make it . . worth while.

Write for new Illustrated Catalogue and Terms.

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SYRACUSE, N. Y.

BERLIN BRIDGE BUILDING

OUR CATALOGUE
OF THREE HUNDRED PAGES ILLUSTRATING AND DESCRIBING A LARGE NUMBER OF

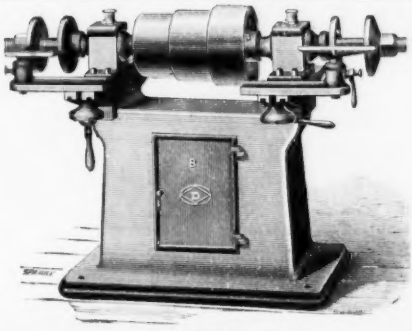
BRIDGES
BUILDINGS
AND ROOFS

Designed and Built by us
Is now ready and will be sent on application.

THE BERLIN IRON BRIDGE CO.
EAST BERLIN, CONN.

BE WISE

THE GOBEILLE PATTERN COMPANY
(PROMPT AND RELIABLE)
CLEVELAND, OHIO

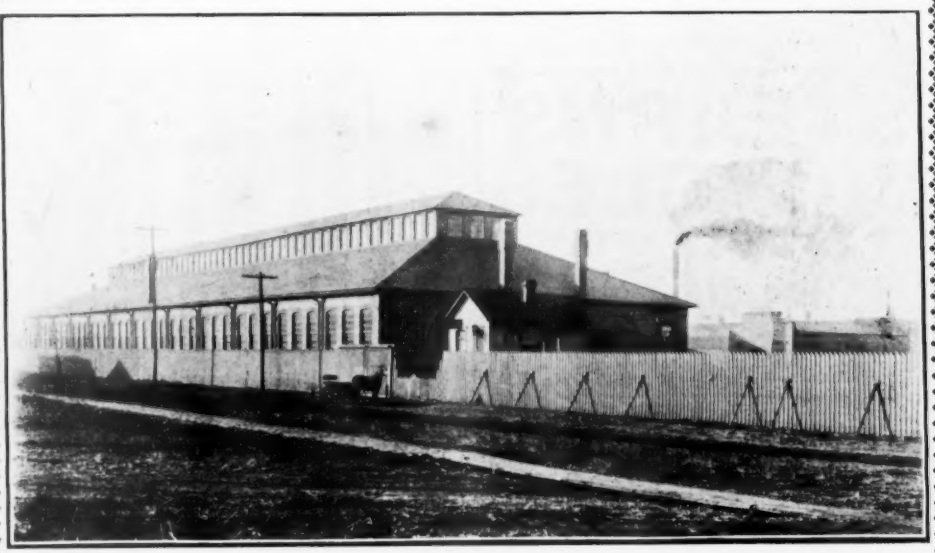


No. 8 GRINDER.

If you want a
Big, Heavy Grinder

For foundry work, here it is. We also have smaller and larger sizes. Our catalogue No. 19 tells all about them.

DIAMOND MACHINE CO. Providence, R. I.



The Decatur Malleable Iron Works, of Decatur, Ill., situated in the center of the Garden Spot of the United States, and surrounded by the best of transportation facilities, intelligent labor, etc., desires to manufacture upon a much larger scale, and is offering unusual inducements for the investment of capital looking to this object.

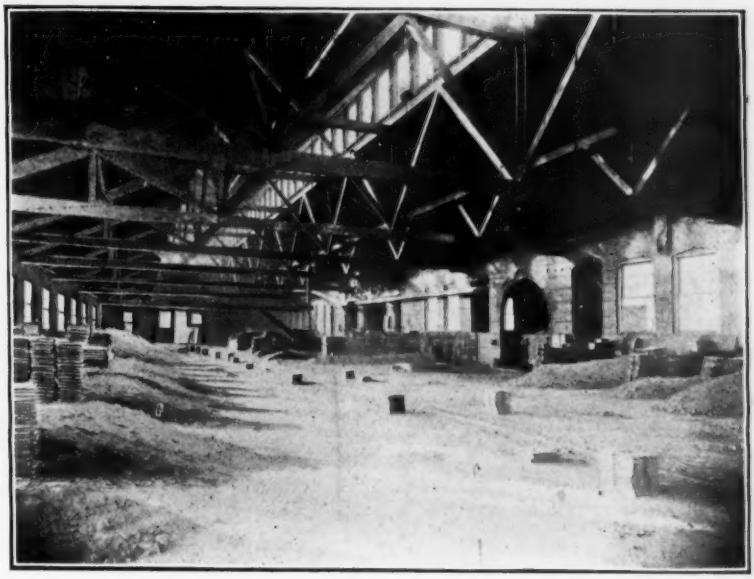
The malleable iron business is expanding at a great ratio and, being situated in the middle of a community importing a large amount of this material, this plant has advantages second to none. It is now in successful operation.

We invite the fullest investigation and will be pleased to answer any bona fide inquiries.

. . . . . THE . . . . . .

DECATUR MALLEABLE IRON WORKS,

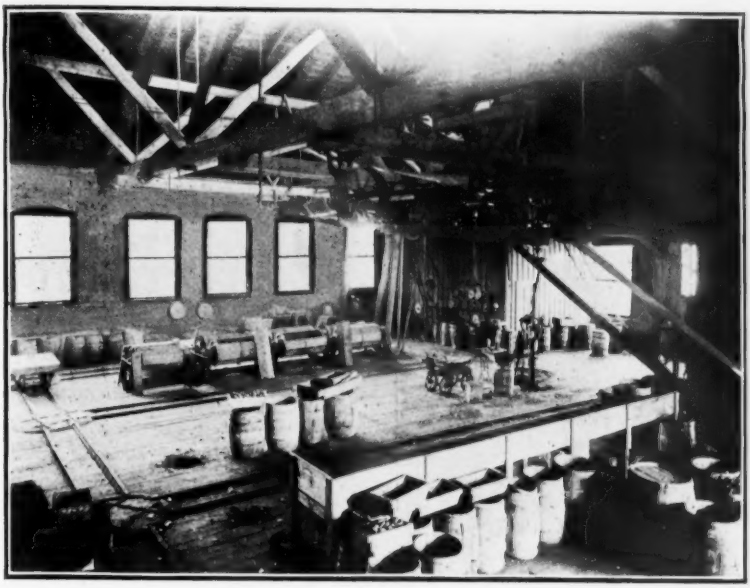
DECATUR, ILLINOIS.



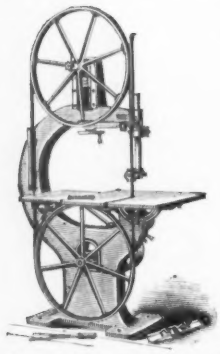
SECTION OF MOLDING ROOM.

THE DECATUR MALLEABLE IRON WORKS

DECATUR, ILLINOIS.



CLEANING AND SORTING ROOM.



4 in. and 36-in. Band Saw Machine.

... Complete Outfits ...

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Pattern Shops

STRICTLY FIRST-CLASS TOOLS.

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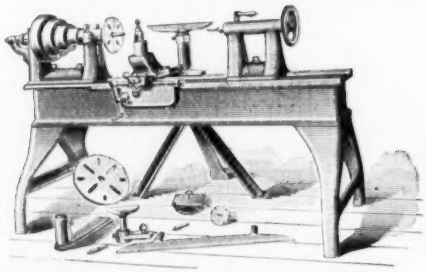
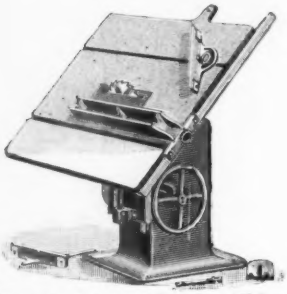
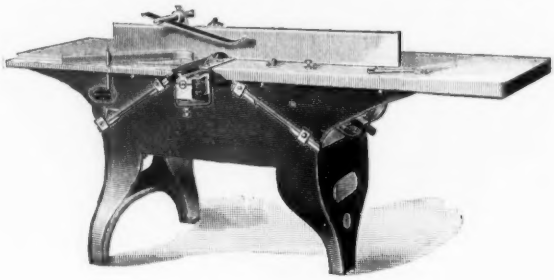


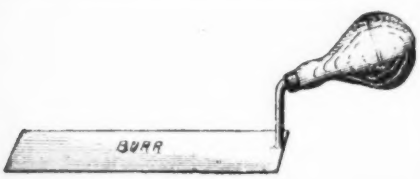
Pattern Makers' Lathes. Iron Bed with or without Carriage.

THE FRANK H. CLEMENT CO. 336 LYELL AVENUE, ROCHESTER, N. Y.



No. 1 Variety Saw Bench. All iron and steel.





Prosperity is Here

at last! We think so, as our orders for . . . . . **Molder's Tools** are now greater than at any previous time in our history. We have doubled the capacity of our plant since January 1st and are now working day and night to try and keep pace with our orders.

See that you get the best

Molder's Tools

made by buying Tools made by us. Sold by all first class Foundry Supply Houses and Hardware Dealers; we also sell them when you can't get them from your dealer.

Burr's Damascus Tool Works

Largest Manufacturers of Molder's Tools in the World.

66-72 Fort St. E., DETROIT, MICH.

TWO MILLS PITTSBURGH, MAUCH CHUNK.

TO MAKE CLEAN, SMOOTH, BRIGHT CASTINGS, USE THE BEST FACINGS.

THE BEST FACINCS CAN BE HAD FROM

McCORMICK,
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J. S. McCORMICK Co. Incorporated, **Pittsburg, Pa.**

FOUNDRY MOLDING MACHINES,
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PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

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ELIZABETH, N. J.

ESTABLISHED 1875.

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FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

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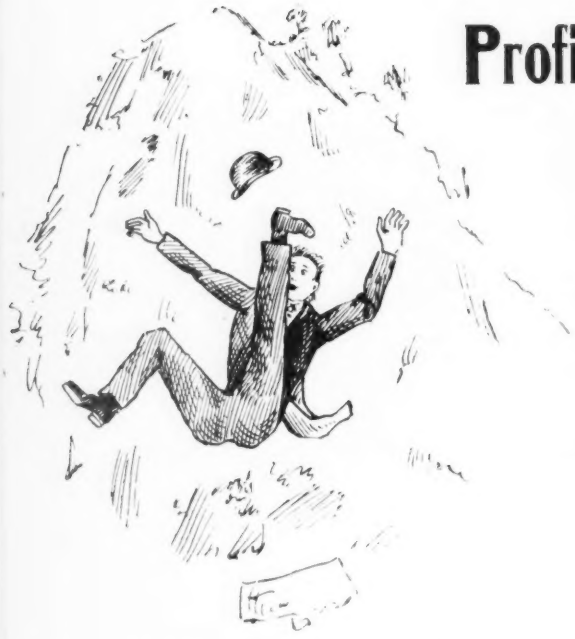


Profitable Delaying.

The world belongs to him who hustles, but he must hustle wisely.

There are times when the right kind of waiting pays.

It doesn't pay to wait when you are in the track of an avalanche that is making up schedule time.

It does pay to wait when you are buying foundry supplies, until you are sure you are buying to your own best advantage.

It costs only two cents and takes only two days to bring me into competition.

No matter what you want, if it is for the foundry, I have it. My goods will be the best attainable. The prices will be the lowest consistent with that.

Hasten slowly and hustle wisely.

The lightning bug is brilliant,
But he hasn't any mind;
He blunders through existence
With his headlight on behind.
The measuring worm is different;
When he goes in for pelf,
He reaches ahead as far as he can
And then he humps himself.

F. B. STEVENS

COR. GRISWOLD AND ATWATER STREETS,

DETROIT, MICH.

A Word

as to

Joseph Dixon Invented the Plumbago Crucible

DATE OF INVENTION
1826.

Dixon's Crucibles have been in the Market SEVENTY YEARS.

Dixon's Plumbago Crucibles

Dixon's Crucibles are Standard all over the GLOBE.
Dixon's Crucibles are used in every country on the Globe where metals are melted.
Dixon's Crucibles have the highest records for HEATS.
Dixon's Crucibles are made to get

BEST RESULTS WITH THE LEAST COAL.

Dixon's Crucibles are made of many mixtures to suit all kinds of work.
Dixon's Crucibles are made special for Steel Melting.
Dixon's Crucibles are made special for Nickel Melting.
Dixon's Crucibles are made special for Brass Melting.
Dixon's Crucibles are made special for Composition Melting.
Dixon's Crucibles are made special for Phosphor Bronze Melting.
Dixon's Crucibles are made special for German Silver Melting.
Dixon's Crucibles are made special for the Melting of Precious Metals.

In ordering you will be benefitted by mentioning the kind of Metals melted. Write for pamphlet **"How to Use Plumbago Crucibles."** The best are the cheapest, as they must stand the punishment of high heat and much wear and tear. The "Dixon" records in average efficiency, in general good behaviour and in volume of sales, far in the lead.

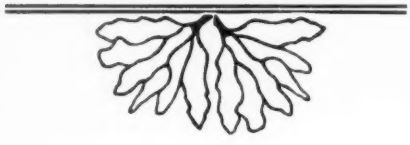
Jos. Dixon Crucible Company,

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

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Established 1872. Incorporated 1895.

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CRUCIBLES for Brass Melting .
CRUCIBLES for Steel Melting .
CRUCIBLES for All Purposes . .
CRUCIBLES of All Sizes . . .
STOPPERS, Twenty-one Styles .
LIDS, COVERS, CAPS, . . .
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PLUMBAGO FINE DUST . . .

ALL
ARTICLES
CONTAINING
PLUMBAGO

Crucible.

ROBT. J. TAYLOR & SON

TRADE MARK.

COR. 19th & CALLOWHILL ST. PHILA.

Crucible

Dipper.

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Crucibles

For melting Steel, Brass, Copper, Gold, Silver, Nickel and Metals and Alloys of Every Description; SmallCrucibles for making Assays and fine pure Plumbago for lubricating, etc.

We are practical workmen and have studied the requirements of the different metal works in this country, as well as in Europe. We also work strictly by chemical analysis, giving a uniformity at all times never before approached in this or any other country.

We make All Sizes, from 8 oz. to 2 ton Capacity.

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1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

There are Two Kinds of

ROTARY PRESSURE

BLOWERS

THE ROOTS

AND OTHERS

OUR BLOWERS . . . . .

represent all the "up-to-date" ideas and embody (what no other . . . . blower can) forty years of experience in the construction of this type of machine . . . . . .

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

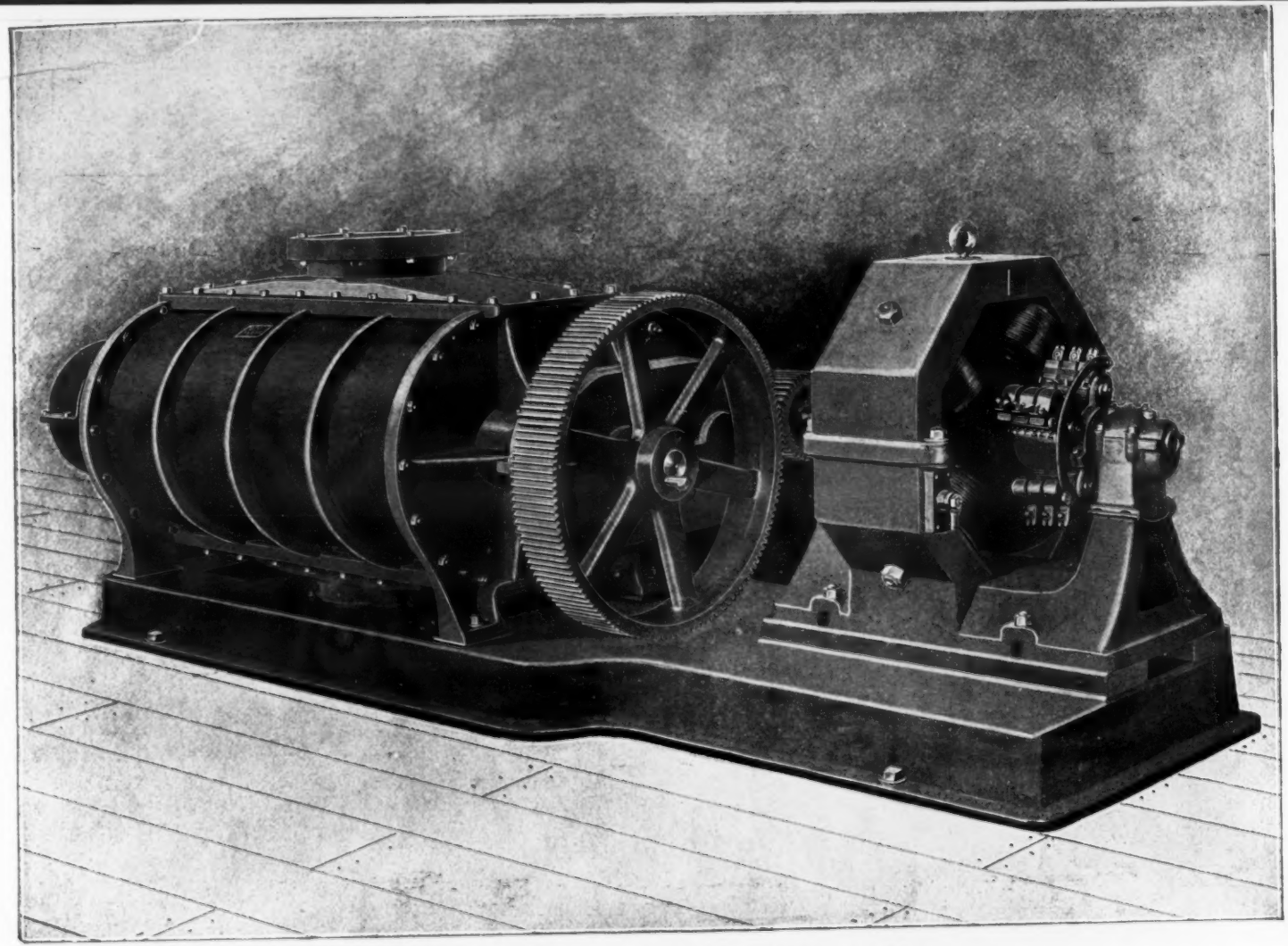
P. H. & F. M. ROOTS CO.,

109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

VANDERGRIFT BLDG., PITTSBURG, PA.

AND AMERICAN GAS COMPANY,

222 South Third Street, PHILADELPHIA, PA.

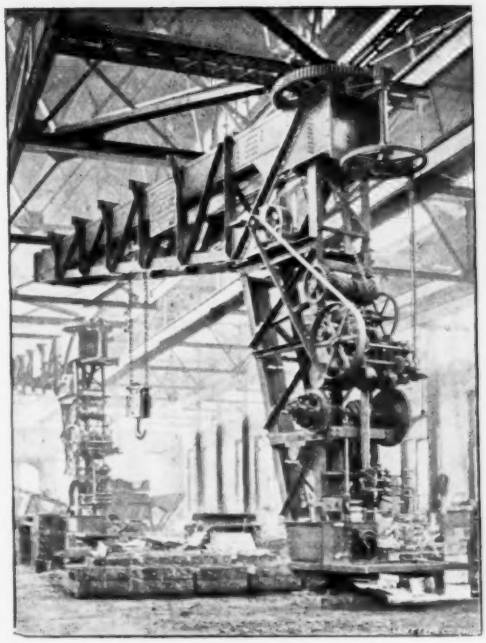


ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



In connection with our Machine Tool Business, we conduct a large foundry where practical tests are continually made of new labor-saving devices. The manufacture of

IMPROVED FOUNDRY CRANES

has become an important feature.

This illustration shows a . . . . . .

Quick-Acting Electric Jib Crane

built by us and erected in the foundry of the Baldwin Locomotive Works. A similar crane in process of erection appears in the background.

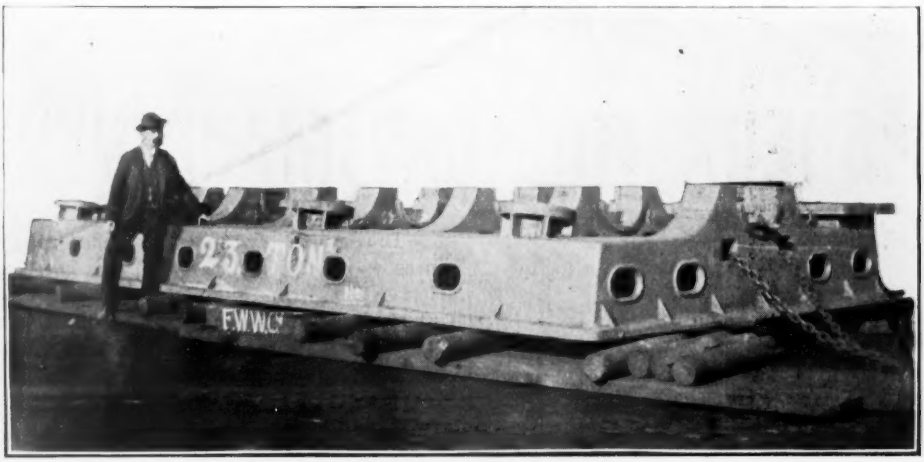
Centrifugal Sand Mixer

Since the introduction and favorable reception of this effective, expeditious and economical **machine for preparing sand for molds and cores** we have simplified its construction and cheapened its cost. The capacity of the machine is remarkable, being limited only by the facilities for feeding sand into the hopper. Two men will easily shovel 5 tons an hour into the machine.

The qualities of "toughness" and "porosity" are materially improved by this process of preparing molding sand.

ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

This is an illustration of the Casting we were talking about last month.



You can judge the size of the casting from the size of the man standing along side of it.

It is 26 feet long, 13 feet wide, 3½ feet deep.

It weighs 23 tons.

It is a perfect casting.

It is the largest casting ever made on the lakes.

It was made in green sand.

The sand was Zanesville No. 4.

Do you want to produce castings which will give you a national reputation? You can do it with the aid of Zanesville Sand, no matter whether your work is light or heavy. Zanesville is the only sand that stands up when put to a test. Kindly glance over the above figures and be convinced. They are eye-openers. Samples for the asking, if you will tell us what kind of work you are doing. Write us to-day. Your men will do more and better work with Zanesville than with any other sand.

Or Consult
Our Western Man . . .
H. S. VROOMAN,
220 W. 20th St., CHICAGO

AYERS, the Sand Man
ZANESVILLE, OHIO.

DIRECTORY OF LEADING PIG IRON DEALERS.

MATTHEW ADDY & CO.
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Agencies,
Chicago, Detroit, New York,
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CLINTON IRON & STEEL CO.
Manufacturers of the
CLINTON INSPECTED FOUNDRY IRON
CELEBRATED "CLINTON" SOFTENER
PITTSBURG, PA
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THE DOMHOFF & JOYCE CO.
PIG IRON-COKE.
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F. A. GOODRICH & CO.
Incorporated
PIG IRON, STEEL, COKE, ETC.
Detroit, Mich.

M. A. HANNA & CO.,
COAL, IRON ORE
and PIG IRON.
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PIG IRON and COKE,
Columbus, O. St. Louis, Mo.

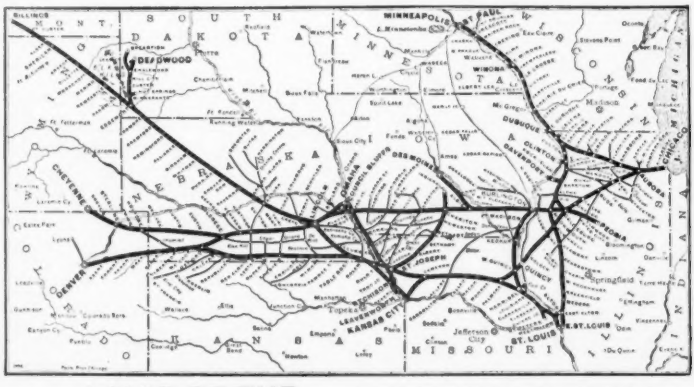
SUPERIOR CHARCOAL IRON COMPANY,
Lake Superior Charcoal
PIG IRON,
General Office,
913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

Burlington Route

A WORD TO MANUFACTURERS

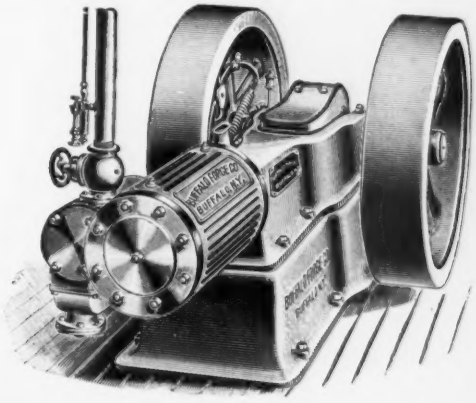
The Industrial Department of the Chicago, Burlington & Quincy Railroad is organized for the purpose of aiding in the location of factories along the line of this road. No section of the country has greater resources to attract the manufacturer. Cheap coal and an abundance of raw material. Many cities on our line offer liberal inducements to aid in establishing new plants.

We solicit correspondenee, and will assist manufacturers seeking a new location in every way possible. *GEO. H. ROSS, Superintendent,*
209 Adams St., CHICAGO, ILL.

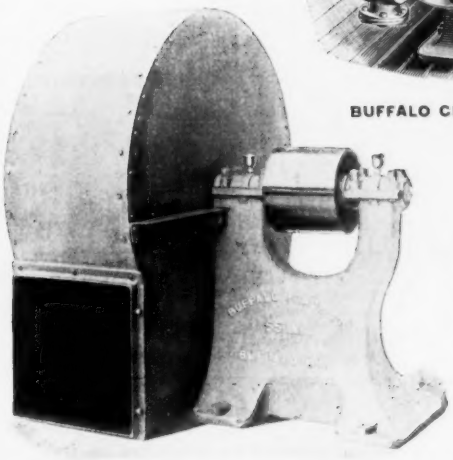


A MAP OF THE BURLINGTON ROUTE

ITS 7500 MILES OF ROAD REACH EVERY IMPORTANT CITY BETWEEN THE GREAT LAKES AND THE ROCKY MOUNTAINS.



BUFFALO CLASS "A" AUTOMATIC ENGINE.



BUFFALO TUMBLING BARREL EXHAUSTER.

Tumbling Barrel Exhausters are easily applied, thoroughly efficient, and change casting cleaning rooms from a death-dealing pestilence to a comfortable working apartment.

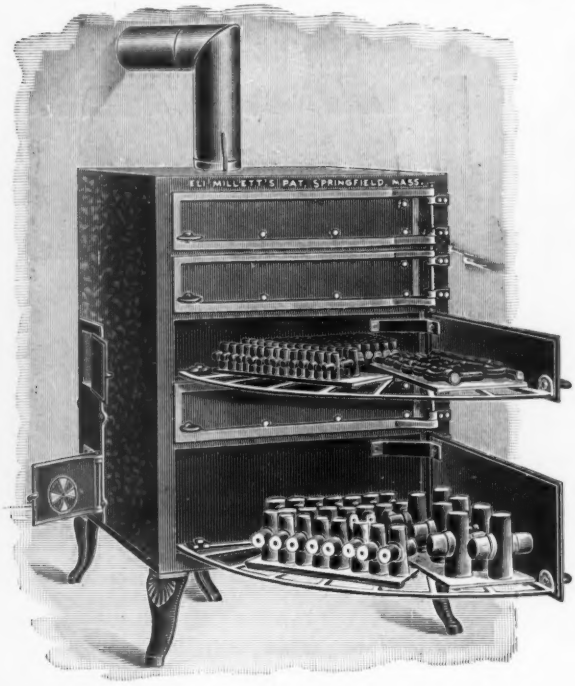
Send for details.

Our 400 Page Catalogues tell all about these machines, applications, etc.; also Fan System of Heating Foundries, etc.

BUFFALO CUPOLA BLOWER.

Buffalo Forge Company,

BUFFALO, N. Y.



Millett's Patent Core Oven

Double Doors,
One closing the oven when the other is open.

THE BEST IN THE WORLD.

No Foundry using small Cores can afford to be without it.

Over two hundred in use.

Send for our new Catalogue giving names of those using them.

Millett Core Oven Co.

BRIGHTWOOD, MASS.

For Sale by THE J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Chicago, Ill.

Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

MANUFACTURERS OF

"CLINTON" AND "HECTOR"

INSPECTED FOUNDRY IRONS . . . . .

ALSO
Sole Factors for DUNBAR STRONG IRON

In New York and New England.

FURNACES, PITTSBURGH.

NEW YORK OFFICE, No. 15 Cortlandt St.

Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

ESTABLISHED 1854.

Brooklyn Fire Brick Works

CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

Send for Illustrated Catalogue and Prices.

88 Van Dyke Street, BROOKLYN, N. Y.

The Coburn Patent Trolley Track

PARLOR DOOR HANGERS.

The adjustment is in the Track and not in the Hanger, as are others.

☞**Send for Book.**

The Coburn Patent Trolley Track

BARN DOOR HANGERS.

Impossible for door to jump the track. Very simple and cheap to apply.

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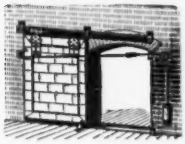
The Coburn Patent Trolley Track



FIRE DOOR HANGERS.

Recommended and adopted by fire underwriters all over the United States.

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The Coburn Patent Trolley Track

Overhead Tramway

Furnished complete with straight and curved track, switches, frog brackets, single and double carriers.

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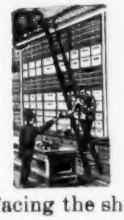
The Coburn Patent Trolley Track

—AND—



Patent Rolling Ladder Systems

Over 10,000 in use in the U. S. Roll suspended from ceiling or facing the shelves.

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The Coburn Trolley Track Mfg. Co.,

HOLYOKE, MASS.

CORE COMPOUND

GLUTROSE

(Trade Mark.)

The Universal Liquid Core Compound

Patented in the United States, England, France and Belgium.

GLUTROSE was invented and is manufactured by a practical foundryman of many years' experience, It has been used in the Pennsylvania Railroad Foundry at Altoona and other large foundries for the past three years with the most satisfactory results.

It is cheaper and better than flour, rosin, oil, molasses or any other compound in use; takes the place of all other materials and never varies in quality.

WILL MAKE FIRST-CLASS RADIATOR CORES WITHOUT RODDING.

WHY PAY 30 to 40 CENTS FOR LINSEED OIL WHEN THE SAME RESULTS CAN BE OBTAINED FOR HALF THE MONEY?

WILL NEVER BLOW THE CASTINGS.

AMERICAN GLUTROSE WORKS

Sole Manufacturers.

OFFICE: PENN MUTUAL BUILDING,

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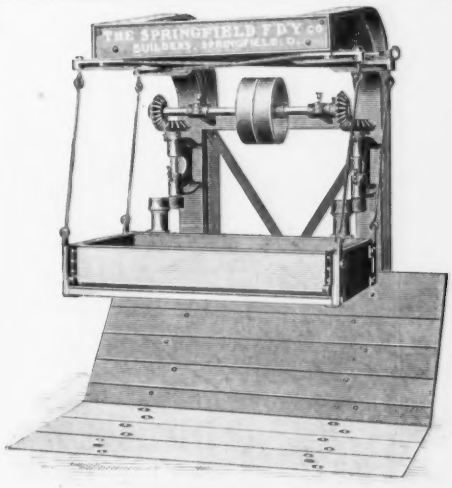


THE PERFECT

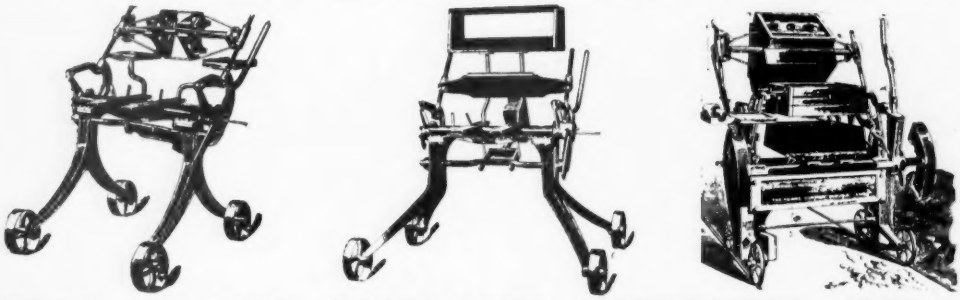
Sand Riddling Machines

BOTH HAND AND BELT POWER.

These are the Best, Simplest, Most Durable and Most Easily Operated Sand Riddling Machines made. For full particulars and references, address,

The Springfield Foundry Co., SPRINGFIELD, OHIO.

FARWELL'S **MOULDING MACHINES** Send for Catalogue



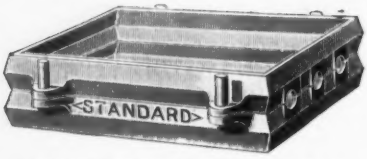
THE ADAMS COMPANY, DUBUQUE, IOWA

Estate of Oscar Barnett.

BRUEN, HAMILTON and McWHORTER STREETS
NEWARK, N. J.

Manufacturers of Supplies for BRASS FOUNDRIES.

<Standard> Flask.



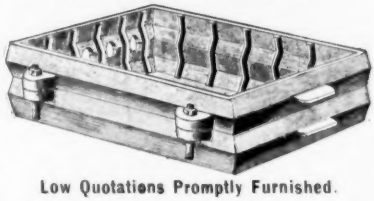
Finished Hardware Specialties to Order.

Not milled with Emery Wheels, but accurately planed

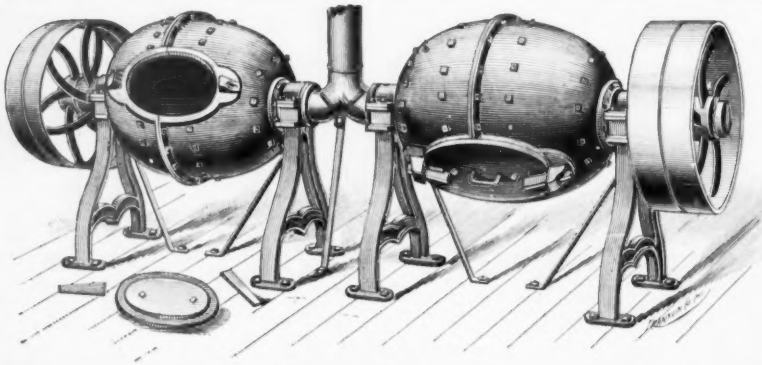
Which is your choice. We make both styles.

ESTABLISHED 53 YEARS

Ribbed Flask.



Low Quotations Promptly Furnished.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does doublethe work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

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Stover Manufacturing Co.

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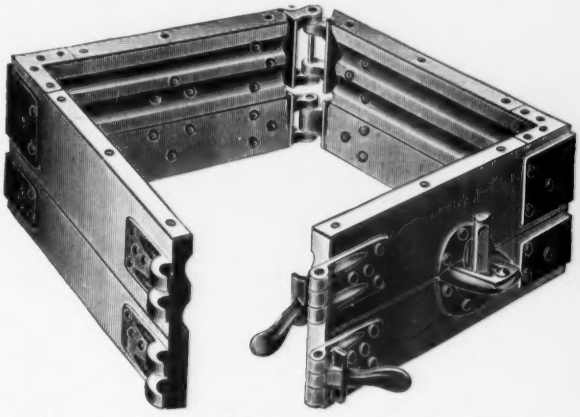
We can save you money by building your Snap Flasks.

EUREKA IMPROVED SNAP FLASK.



No. 1—Hardwood, 1¼ in. Stock, $2.75 each. No. 2—Whitewood, 1¼ in. Stock, $2.50 each.

Made of the best Kiln-Dried Lumber, Bound with Iron and All Trimmings Riveted. Write for Prices.

C. H. GREEN & CO., Syracuse, N. Y.

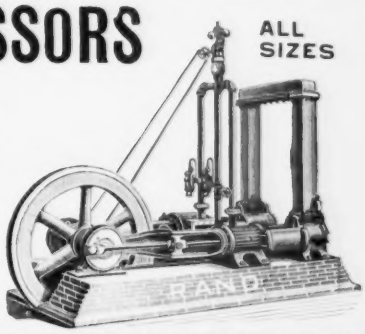
RAND AIR COMPRESSORS

FOR FOUNDRIES.

SIMPLE. DURABLE. ECONOMICAL.

Our **Duplex Compressor,** Compound Air Cylinders, with Inter-Cooler and Compound Steam Cylinders, with Meyer Cut-off Valves, is the best construction for small and medium sizes.

ALL SIZES



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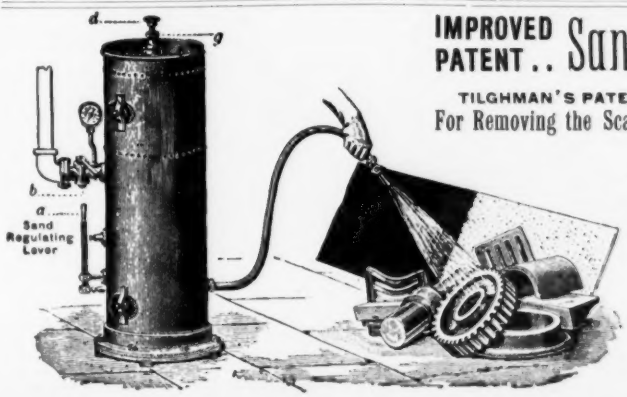

IMPROVED PATENT.. Sand Blast Machinery

TILGHMAN'S PATENTS. MATHEWSON'S PATENTS.

For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

WARD & NASH,

SOLE AGENTS,

35-37 So. Canal Street, CHICAGO.

23-25 Purchase St., BOSTON.

Send for Catalogue.

Many Castings are thrown away

Which could as well be saved. Their strength is not affected. The only reason for dumping them on the scrap heap is their appearance.

The iron boils a little around a core, a bit of scum is made, and when the casting is put under pressure it sweats, and shows small leaks, which, under ordinary conditions, would remain unnoticed.

As such castings are thrown away there comes the sigh: Too bad. Nice casting. Labor lost.

Stop your sighing. Apply SMOOTH ON Compound. It will make a leaky casting steamtight, and the way it cures such defects as blowholes, shrinkholes and other common blemishes, is a revelation.

SMOOTH ON is not a mere filling. It becomes part of the casting. No pounding or jolting can separate it from the casting. A government expert even can't tell which is which.

That is the beauty of SMOOTH ON. No one can know you are using it. When a casting shows symptoms of general debility, you give it a dose of SMOOTH ON and, presto, defeat is turned to victory; what would have been a loss is made a profit, and no one need know of how it is done but yourself.

Send for literature telling how to reduce the size of your scrap pile.

SMOOTH ON MFG. CO., Vreeland Tompkins, Mgr., 551 Communipaw Ave., JERSEY CITY, N. J.

Burr's Damascus Tool Works

66-72 FORT STREET WEST,

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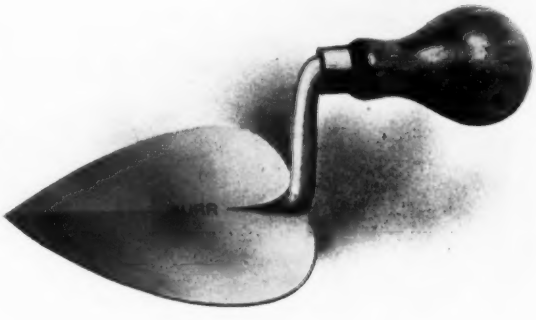
INSIST

on getting the "BURR" Tools from your Foundry Supply House or Hardware Dealer, as . . they have no equal.



Largest Manufacturers of MOLDERS' TOOLS IN THE WORLD.

Heyl & Patterson

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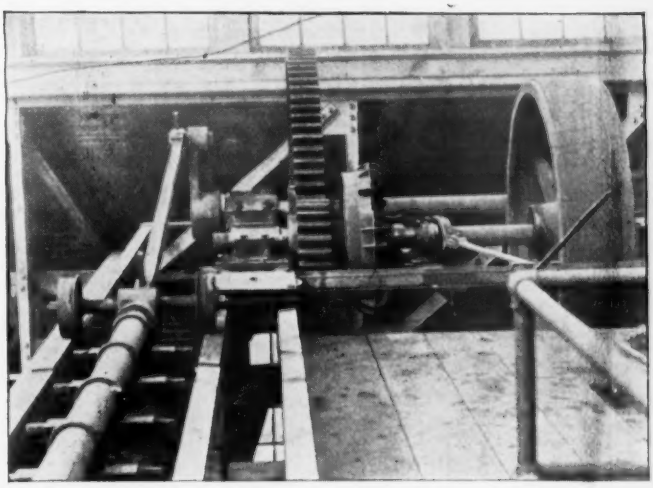
PITTSBURG, PA.

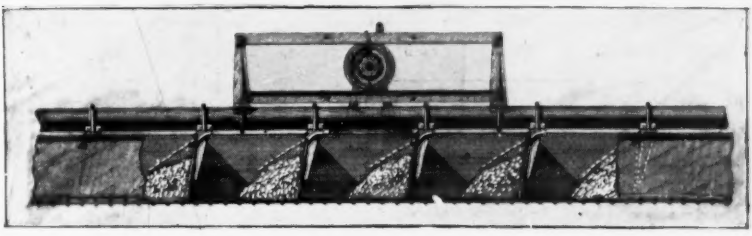
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

OTHERS MAY OFFER

New Fangled Substitutes for Lycopodium

BUT GOOD, OLD-FASHIONED

NEW ENGLAND CHARCOAL FACING

will do just as good work, is not injurious to inhale, and cheapest of all. The fact you have used common charcoal, that was not right, is no reason you should not try ours. We guarantee every barrel. Let us send you a sample and tell you about it.

SPRINGFIELD FACING CO., SPRINGFIELD, MASS.

MICHIGAN CENTRAL

"The Niagara Falls Route."

A FIRST CLASS LINE FOR FIRST CLASS TRAVEL.

ROUTE OF THE **"North Shore Limited."**

"As near perfection in the way of construction, appointments, service and able management as can be conceived in modern railroading.—*Extract from report of Railroad Commissioner, State of Michigan.*

O. W. RUGGLES, G. P. & T. Agent, CHICAGO.

Investigation

will prove that every Stove Foundry with a national reputation for the finish of its product employs . . . . . .

Kelly's Heavy Stove Plate Facing.

That is what produces that exquisite smoothness which marks the high grade casting and becomes the standard others try to reach. It is just as easy to make good castings as poor ones, providing you go at it right, and there is decidedly more money in the first-class article. Let us help you on the right track.

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AKRON TUBULAR STEEL WHEELBARROWS FOR . . FOUNDRY USE.

Re-inforced Trays.

SOLID FRAME.
No Holes Drilled into it.
All Parts Clamped on.

PERFECT FORWARD DUMP.
STRONGEST, EASIEST HANDLED.
LIGHTEST AND MOST DURABLE.

McNEIL'S PATENT BALANCED AUTOMATIC DUMP CHARGING BARROW.

THE AKRON CULTIVATOR CO. MFRS.
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DO NOT BE MISLEAD

by persons claiming they've
got FACINGS and BLACKINGS
"as good as *Obermayer's.*"

BUY THE ORIGINAL AND BEST

Just as cheap as the imitations.

THE

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CINCINNATI, O. CHICAGO, ILL.
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SPECIAL DEPARTMENT.

Our Foundry Equipment Department is now under the sole charge of . . . . . .

MR. S. T. JOHNSTON

formerly of The Whiting Foundry Equipment Co. Parties contemplating any changes or improvements in their foundry will do well to correspond with us . . . . . .

Our new Catalogue will be ready for distribution in about three weeks. Write for a copy and please mention THE FOUNDRY . . . . . .

J. W. Paxson Co

MANUFACTURERS OF

Foundry Equipment and Foundry Supplies

Also Manufacturers of

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DIGGERS AND SHIPPERS OF

MOLDING SAND For Iron, Steel and Brass Foundries.

PHILADELPHIA, PA.

A Word

as to

Joseph Dixon Invented the Plumbago Crucible

DATE OF INVENTION
1826.

Dixon's Crucibles have been in the Market SEVENTY YEARS.

Dixon's Plumbago Crucibles

Dixon's Crucibles are Standard all over the GLOBE.
Dixon's Crucibles are used in every country on the Globe where metals are melted.
Dixon's Crucibles have the highest records for HEATS.
Dixon's Crucibles are made to get

BEST RESULTS WITH THE LEAST COAL.

Dixon's Crucibles are made of many mixtures to suit all kinds of work.
Dixon's Crucibles are made special for Steel Melting.
Dixon's Crucibles are made special for Nickel Melting.
Dixon's Crucibles are made special for Brass Melting.
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Dixon's Crucibles are made special for Phosphor Bronze Melting.
Dixon's Crucibles are made special for German Silver Melting.
Dixon's Crucibles are made special for the Melting of Precious Metals.

In ordering you will be benefitted by mentioning the kind of Metals melted. Write for pamphlet **"How to Use Plumbago Crucibles."** The best are the cheapest, as they must stand the punishment of high heat and much wear and tear. The "Dixon" records in average efficiency, in general good behaviour and in volume of sales, far in the lead.

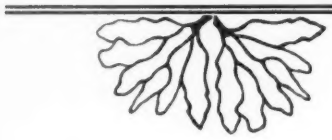
Jos. Dixon Crucible Company,

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
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FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
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OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

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WORKS AT

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The Cleveland Facing Mill Co.

PERFECTION CORE BOX

WILL SAVE YOU MONEY.

It is accurate, being absolutely correct as to measurement; durable, being made of hard seasoned maple; cheap, as a hard wood box can be procured for less money than you can make a pine box for; it is superior to a pin jointed box as joint is continuous its entire length, thus avoiding side motion. No dowel pins to break off. No holes to clean out. Shifting boxes endwise serves to loosen cores, consequently no rapping. Sold by the foot and you can cut it up, or by the box. Write for price list and discount. Hundreds of feet sold.

..... OUR .....

AA Ceylon Plumbago and C.F.M. Founders Perfect Wash

TURN OUT THE BEST CASTINGS.

We can prove it with a free sample, which we are glad to send for the asking.

Car Wheel Mineral Which cannot be beaten in Quality or Price.

FOUNDRY FACINGS,
FOUNDRY BLACKINGS,
FOUNDRY SUPPLIES.

THE CLEVELAND FACING MILL CO. CLEVELAND, OHIO

Crucible.

ROBT. J. TAYLOR & SON

COR. 19th & CALLOWHILL ST. PHILA. TRADE MARK.

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Dipper.

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Crucibles

For melting Steel, Brass, Copper, Gold, Silver, Nickel and Metals and Alloys of Every Description; SmallCrucibles for making Assays and fine pure Plumbago for lubricating, etc.

We are practical workmen and have studied the requirements of the different metal works in this country, as well as in Europe. We also work strictly by chemical analysis, giving a uniformity at all times never before approached in this or any other country.

We make All Sizes, from 8 oz. to 2 ton Capacity.

ROBT. J. TAYLOR & SON,

1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

P. C. COCHRAN, PRESIDENT.
J. H. WURTZ, SECRETARY.

J. R. LAUGHREY, TREASURER.
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WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. 3500 Tons Daily Capacity.

300 30-TON GONDOLA CARS — 50 30-TON COKE CARS.

Shipments of Coal commenced November 23 1893.
" Coke " August 29, 1894.

Coal shipped during -	1893 - - -	3,750 Tons.
Coal and Coke shipped during	1894 - -	204,500 "
" " "	1895 - - -	370,000 "
" " "	1896 - -	353.000 "
" " "	1897 - - -	750,000 "

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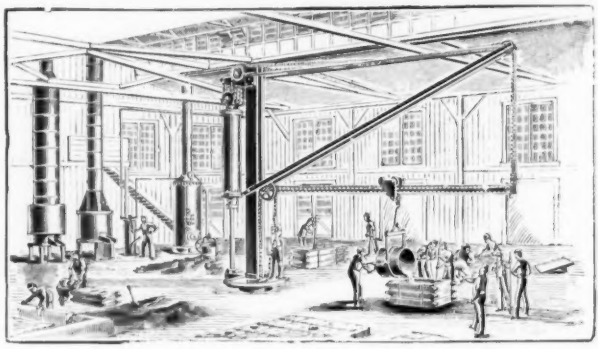
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

SAY, MR. FOUNDRYMAN

Suppose you should put the Ridgway Crane in your shop and after a few weeks' use found out that, sure enough, your very same molders could turn out 50 to 100 per cent. more work for the same wages, you wouldn't run around all over town telling the other fellows, "Oh, you ought to get Ridgway Cranes." Well hardly; you would stay home, saw wood a d say nawthin.'



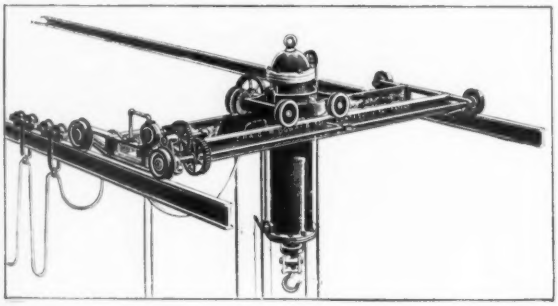
But if some fellow from another place outside of your "sphere of influence" would happen to write you asking about the Ridgway Crane—oh, well, that's different.

This is one aspect of the Ridgway Crane business from the Foundry point of view, and if you are a wise man you will investigate a machine that claims so much.

There is one thing very certain and that is, no man to whom we would sell a crane has to pay for it until he sets it up in his shop and tries it to his heart's content. If he don't want it, it is not a very big job to load it on the cars and send it back to us.

As a matter of fact, however, there is not a foundry using a Ridgway Crane that could possibly do without it. In those foundries where there is no Ridgway Crane, it is simply a case of "Ignorance is Bliss," and lack of profits blamed to the hard times.

Air Hoists. Just One



in use in your shop will tell the whole story. By putting a little oil in a hollow piston rod, we make the whilom erratic air hoist a safe, a gentle, a perfect machine. **Just One** will prove this to you. Such a hoist costs more than an ordinary hoist, but my! it is worth ten times as much. **Just One** hung up will settle all doubts.

"PLEASE TAKE THE ELEVATOR."

Who'd bother with screws and belts,
Who'd spend money for pumps,
Who'd bother with City pressure
With this so cheap and good?

CRAIG RIDGWAY & SON, COATESVILLE, PA.

There are Two Kinds of

ROTARY PRESSURE

BLOWERS

THE ROOTS

AND OTHERS

OUR BLOWERS . . . . .

represent all the "up-to-date" ideas and embody (what no other . . . . blower can) forty years of experience in the construction of this type of machine . . . . . .

THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

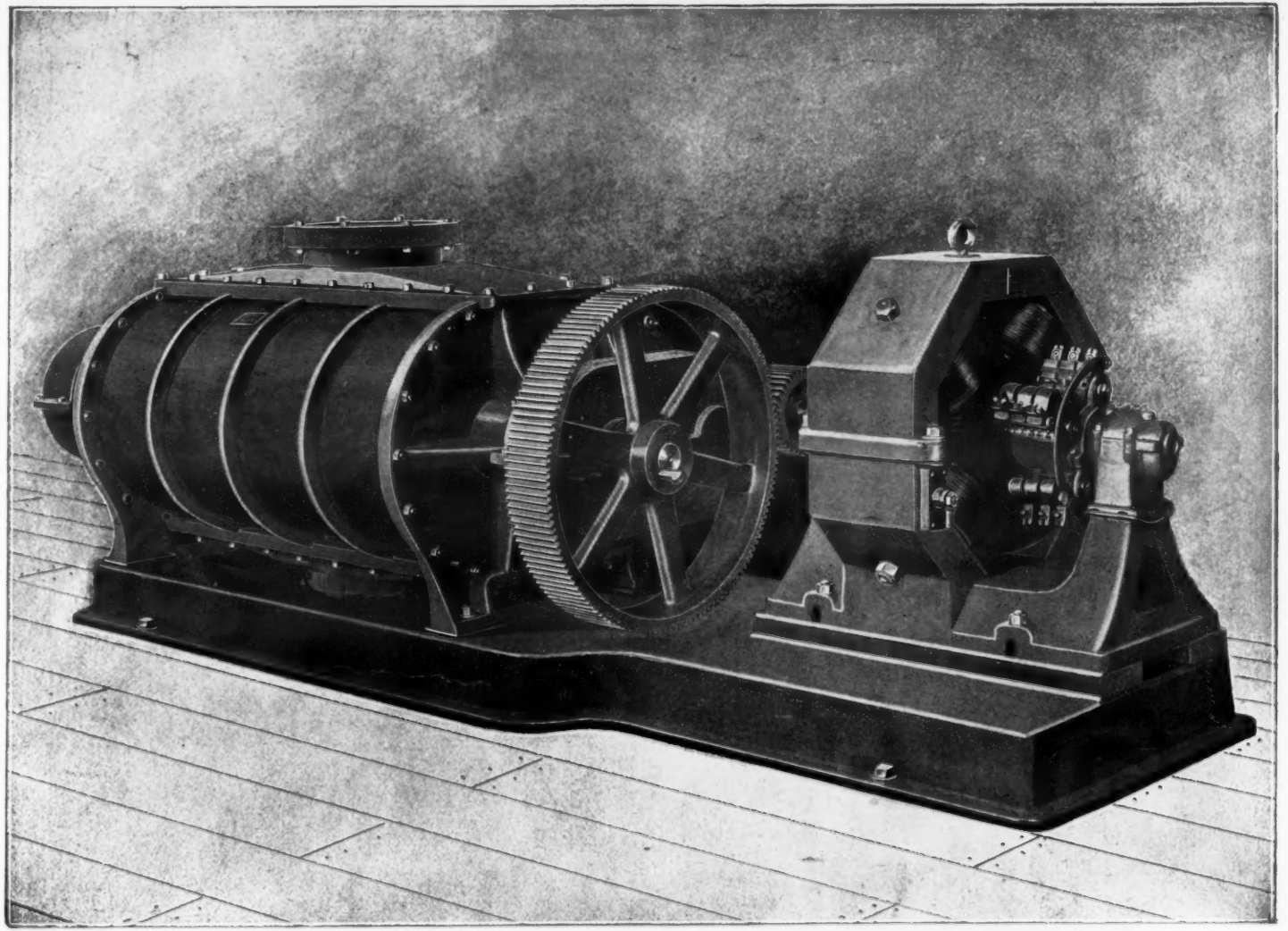
P. H. & F. M. ROOTS CO.,

109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.

VANDERGRIFT BLDG., PITTSBURG, PA.

AND AMERICAN GAS COMPANY,

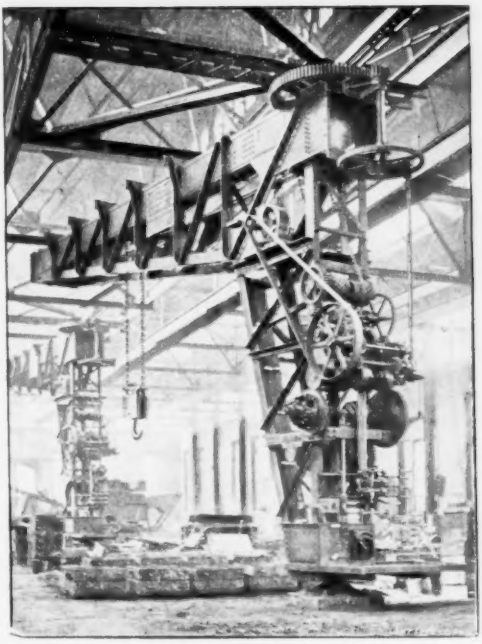
222 South Third Street, PHILADELPHIA, PA.



William Sellers & Co. Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



In connection with our Machine Tool Business, we conduct a large foundry where practical tests are continually made of new labor-saving devices. The manufacture of

IMPROVED FOUNDRY CRANES

has become an important feature.

This illustration shows a . . . . . .

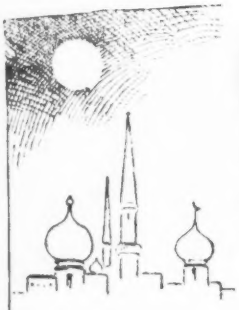
Quick-Acting Electric Jib Crane

built by us and erected in the foundry of the Baldwin Locomotive Works. A similar crane in process of erection appears in the background.

Centrifugal Sand Mixer

Since the introduction and favorable reception of this effective, expeditious and economical **machine for preparing sand for molds and cores** we have simplified its construction and cheapened its cost. The capacity of the machine is remarkable, being limited only by the facilities for feeding sand into the hopper. Two men will easily shovel 5 tons an hour into the machine.

The qualities of "toughness" and "porosity" are materially improved by this process of preparing molding sand.



Feeling Down in the Pants

is a notable symptom when the foundryman starts in to use any kind of molding sand that is offered him.

The results from such a course are:

The molder takes more time to produce a given amount of work.

The castings can not bear comparison with others.

The foundryman loses work.

He receives less for what he does do.

Good work means more work. A fine casting is always a standing advertisement for the man who made it.

Good work means better prices. The best of everything always finds a market. This accounts for some foundries receiving a higher price for their castings than others.

OUR Zanesville Sand has made a reputation for the majority of foundries credited with doing good work. It is **THE Molding Sand,** no matter what you are making.

The molding sand business is not a side line with us. Our interests center right there, which may in a measure account for the care we take to suit the wants of our patrons.

Let us know what kind of work you are doing and we will select a sand which will suit you.

Your men will do more and better work with **OUR Zanesville** than with any other **Sand**

Our Western Man is

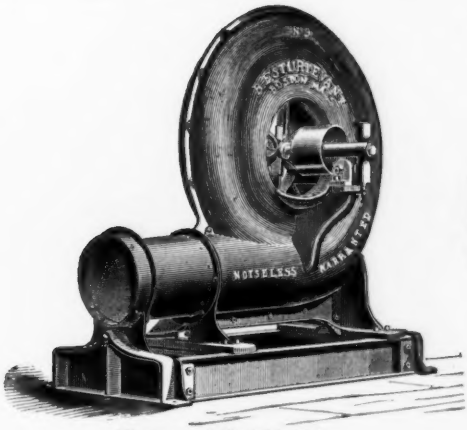
VROOMAN,

220 W. 20th Street
CHICAGO

Ayers,

THE Sand Man.

ZANESVILLE, OHIO.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

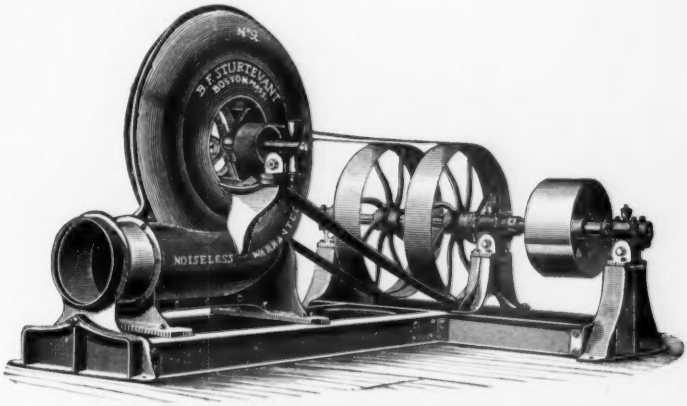
—FOR—

Cupola Furnaces and Forge Fires.

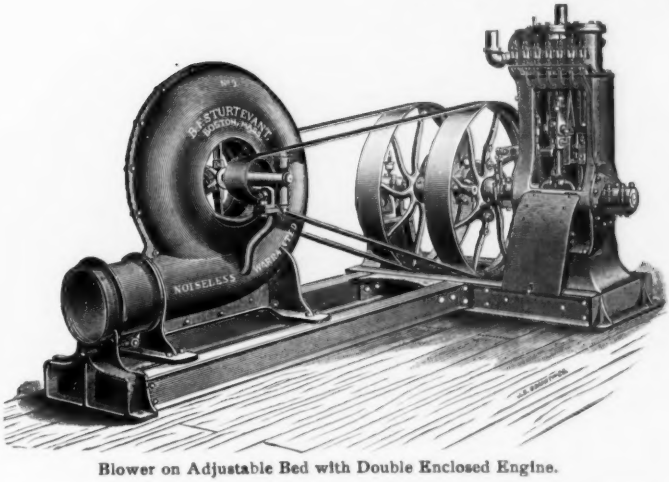
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

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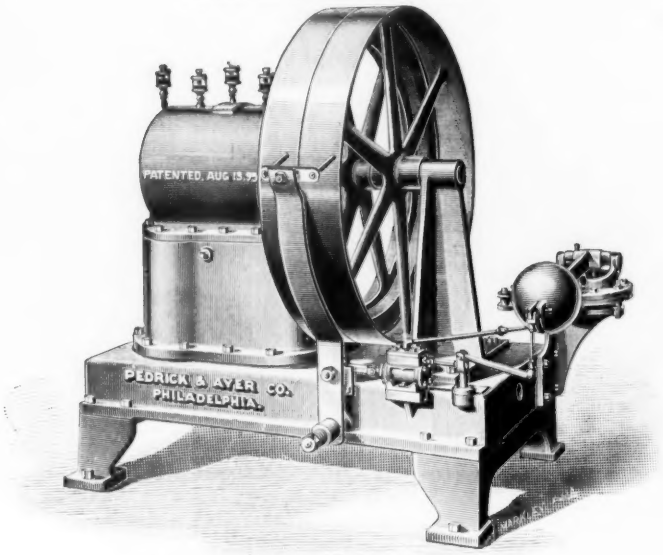
Automatic Compound Belt Air Compressors.

PATENTED AUGUST 13TH 1895.



Straight Lift Hoist. **Built in two sizes, Nos. 1 and 2.**

No.	Size of Cylinders in inches	Revolutions per Minute.	Cubic Feet of Free Air	Horse Power Required.	Size of Pulleys in inches	Shipping Weight of Compressor	Floor Space in inches	Telegraphic Symbol
1	11x 6 6x 6	100-100	32- 50	2-3½	40x5	2875 lbs.	60x40	Parian
2	13x10 8x10	90-120	90-120	9-15	60x6	5370 lbs.	76x60	Parish

AIR HOSE COUPLING

For ½ inch, ¾ inch and 1 inch Hose.

These Compressors will compress more air at less cost than any other make, requiring no attention other than oiling; entirely automatic in action, stopping and starting as air is required. Specially adapted for foundry use. Can be run in series, if so, no stoppage impossible.

Horizontal Air Lift for low ceilings; for general lifting, quick in action and under perfect control of operator.

Straight Air Lift for foundry purposes when equipped with retaining and releasing valve, will hold the load whether heavy or light, in the desired position, as in case of lifting a ladle of molten iron and pouring it or raising a flask to knock out the sand. It can neither ascend or decend as long as connected to air supply.

Air Hose Couplings are designed to do away with long lines of hose. By having suspended along the air line a number of hose equipped with this device, connections can instantly be made or disconnected, allowing one hoist to serve in several places. Each size made in duplicate. Containing a shut-off valve.

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Lake Superior Charcoal
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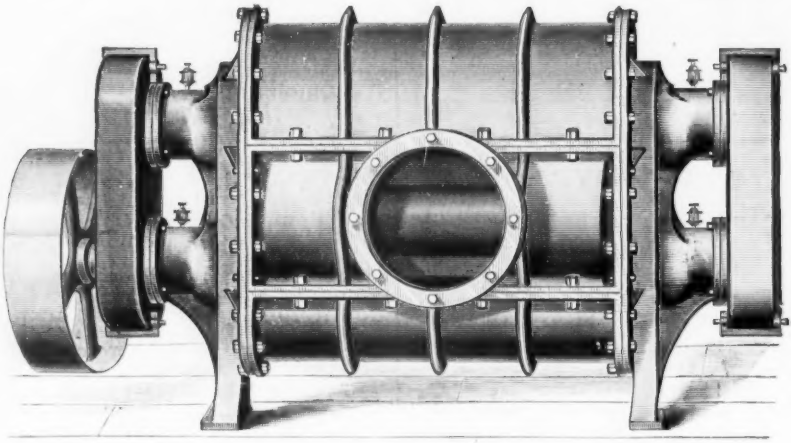
The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

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CRUCIBLES for All Purposes . .

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LIDS, COVERS, CAPS, . . .

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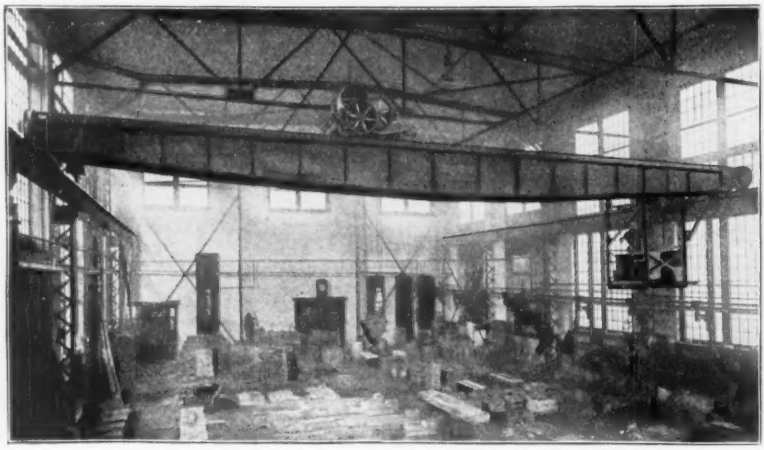
PLUMBAGO FINE DUST . . .

ALL ARTICLES CONTAINING PLUMBAGO

Three Motor Electric or Compressed Air Traveling Cranes



ELECTRIC THREE MOTOR TRAVELER, 50-FOOT SPAN.

Modern Cranes are necessary to produce work economically.

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THE AVERY MOLDING MACHINE.

Prices on application.

SEND FOR CATALOGUE.

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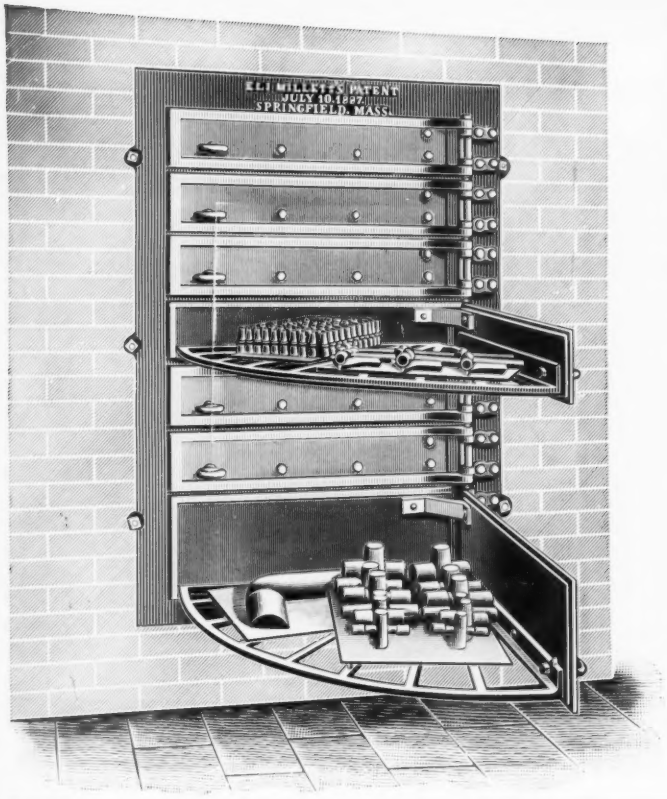
Works, HARVEY, ILL. (Chicago Suburb.)

A BUFFALO BLOWER—Enough Said.



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Double Doors,
One closing the oven when the other is open.

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No Foundry using small cores can afford to be without it.

Over two hundred in use.

Send for our new Catalogue giving names of those using them.

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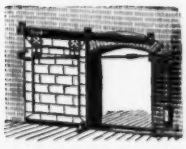

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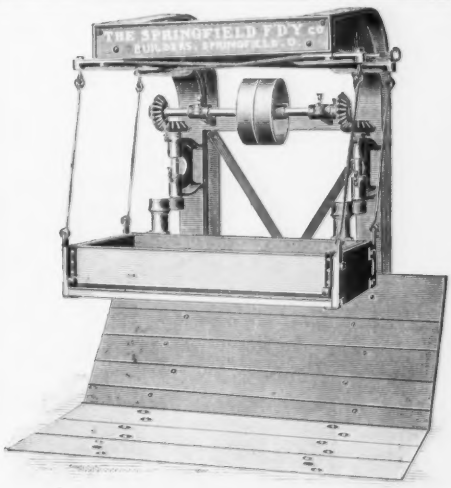

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BOTH HAND AND BELT POWER.

These are the Best, Simplest, Most Durable and Most Easily Operated Sand Riddling Machines made. For full particulars and references, address,

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We solicit correspondenee, and will assist manufacturers seeking a new location in every way possible. *GEO. H. ROSS, Superintendent,*
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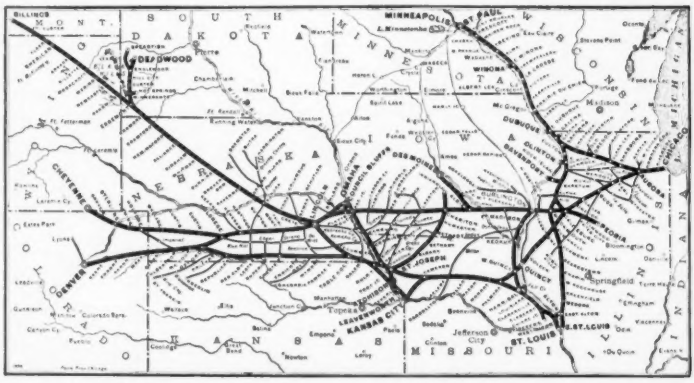

A MAP OF THE BURLINGTON ROUTE

ITS 7500 MILES OF ROAD REACH EVERY IMPORTANT CITY BETWEEN THE GREAT LAKES AND THE ROCKY MOUNTAINS.

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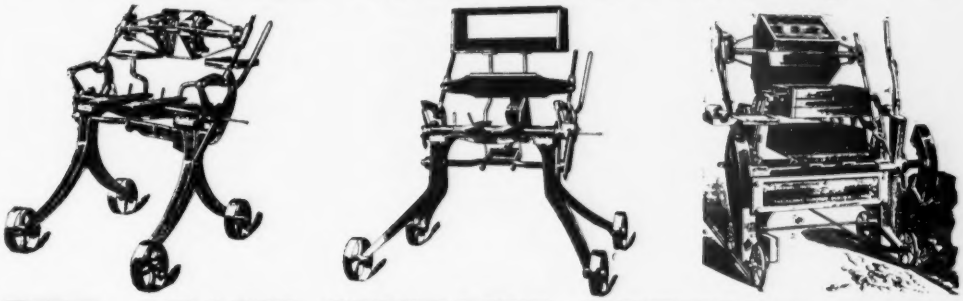

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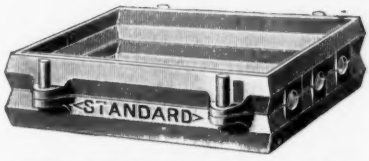

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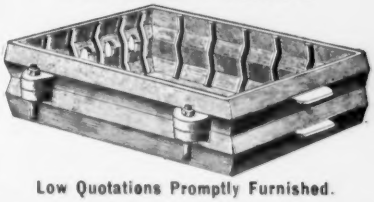

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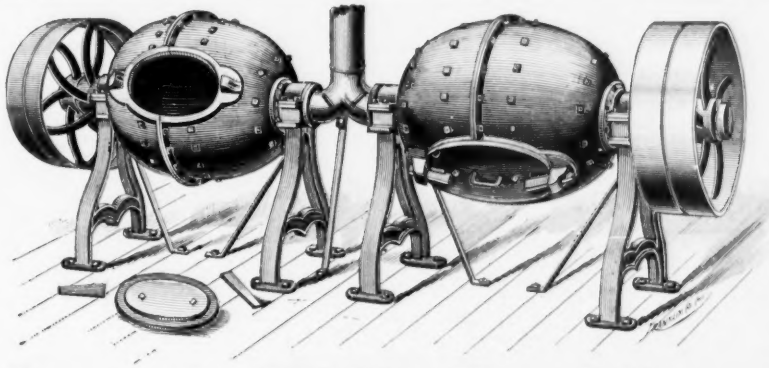

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The Stover Egg Shaped Barrel does doublethe work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

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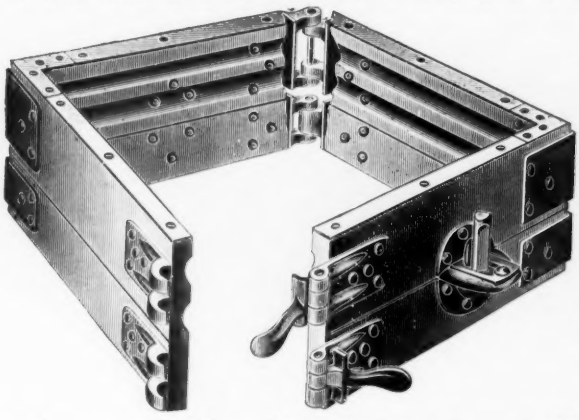

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SIMPLE. DURABLE. ECONOMICAL.

Our **Duplex Compressor,** Compound Air Cylinders, with Inter-Cooler and Compound Steam Cylinders, with Meyer Cut-off Valves, is the best construction for small and medium sizes.

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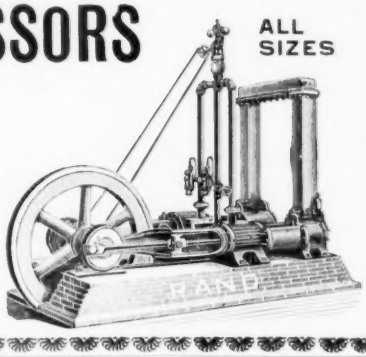

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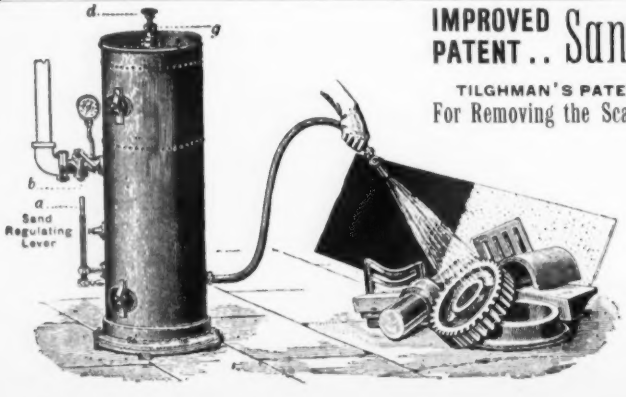
Don't forget our Rock Drills. 100 Broadway, NEW YORK.



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For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

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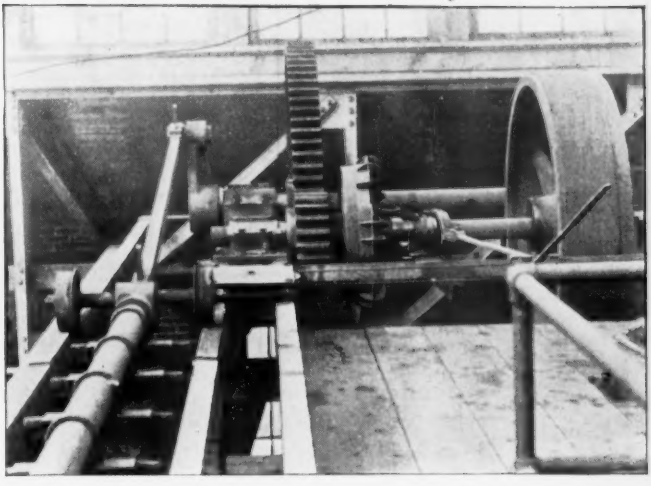
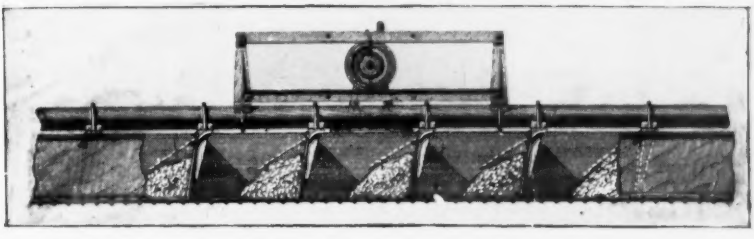
FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





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Complete Installations.

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New Fangled Substitutes for Lycopodium

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will do just as good work, is not injurious to inhale, and cheapest of all. The fact you have used common charcoal, that was not right, is no reason you should not try ours. We guarantee every barrel. Let us send you a sample and tell you about it.

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"The Niagara Falls Route."

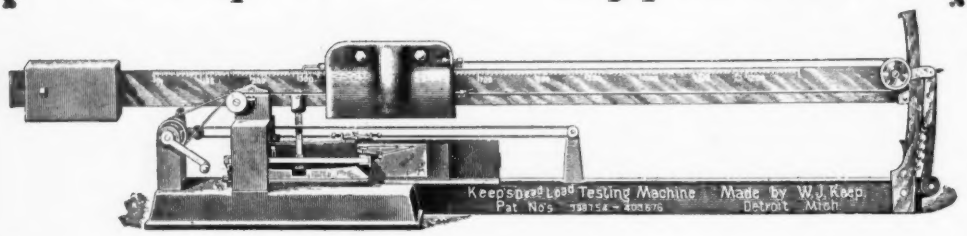
A FIRST CLASS LINE FOR FIRST CLASS TRAVEL.

ROUTE OF THE **"North Shore Limited."**

"As near perfection in the way of construction, appointments, service and able management as can be conceived in modern railroading.—*Extract from report of Railroad Commissioner, State of Michigan.*

O. W. RUGGLES, G. P. & T. Agent, CHICAGO.

"Keep's Test" Apparatus.



PROSPERITY consists in making money when selling castings at the present low prices.

HOW? Adopt modern devices. Some save $10.00 per day in the cost of mixture by regulating silicon by . . . . . .

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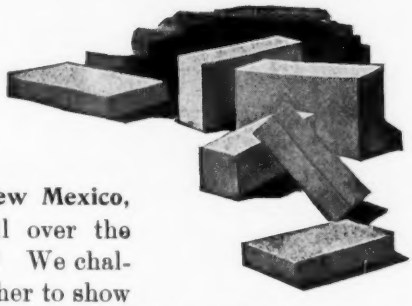
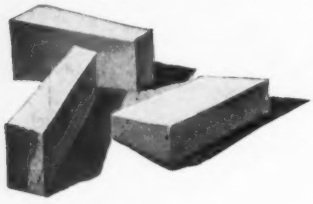
TO SAVE MONEY IN YOUR OWN FOUNDRY, ADDRESS **W. J. KEEP, Detroit, Mich.**

Just as Good as "Franklin Crown!"



Did it ever occur to you that the man who makes that statement is an **imitator** and his goods a **counterfeit?**

DID YOU KNOW that we are shipping **"Franklin Crown" Fire Brick** to **South Africa, Southern California, Old Mexico, New Mexico, Texas, Washington, D. C., Georgia,** and all over the United States, wherever Fire Brick are used? We challenge any one or all of these **imitators** together to show such a record. Do you think this could be done if these bricks were anything but the **best in the land?** And every other brand of brick handled by us is equally as good of its Class, viz: **"Wigton Steel," "Sligo," "W"** and **"Standard,"** also **Cupola Blocks, Molding Sand,** etc.



Garden City Sand Co., * * SECURITY BUILDING, CHICAGO.

No need of having a big head

If you use **Kelly's Plumbago.** The difference in the morning will all be in your favor when you see the way it peels castings of all kinds.

Some people have a habit of telling what they don't know about Ceylon Plumbago and its purity. Our space in THE FOUNDRY is too small to permit of us tell stories. We will just say this much:

A dollar's worth of **Kelly's Plumbago** will do more work than a dollar's worth of any other man's plumbago.

This is the kind of talk there is very little joking about. It is straight business. Samples for your inspection upon request.

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AKRON TUBULAR STEEL WHEELBARROWS FOR . . FOUNDRY USE.

Re-inforced Trays.

SOLID FRAME.

No Holes Drilled into it.
All Parts Clamped on.

PERFECT FORWARD DUMP.
STRONGEST, EASIEST HANDLED.
LIGHTEST AND MOST DURABLE.

McNEIL'S PATENT BALANCED AUTOMATIC DUMP CHARGING BARROW.

THE AKRON CULTIVATOR CO. MFRS.
AKRON, OHIO.

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THE FOUNDRY

The only foundry paper published in the world, and an authority on all matters pertaining to the foundry business.

RATES OF SUBSCRIPTION.

Single subscription to all parts of the United States and Canada, $1 per annum.
" " Universal Postal Union, 1.75 "

ADVERTISING RATES.

One page - -	per month,	$25.00
Half page - - -	"	15.00
Quarter page - -	"	8.50

All pages between front cover and reading matter reserved for whole page advertisements.

Advertisers in THE FOUNDRY have the privilege of discontinuing their advertisements at any time, and will only be charged pro rata for the number of insertions printed. They also have the privilege of changing advertisements as often as desired.

The publishers of THE FOUNDRY appreciate the fact that it is customary for publications, especially the class known as Trade Journals, to quote a rate for advertising from which greater or less discounts are given, according to the persistency of the advertiser. This system is manifestly unfair, as tending to show partiality. We have deducted the usual discount before quoting rates, thus giving it to all alike and no reduction of any sort on the above rates will be made.

Copy for advertisements must be in by the 20th of the month preceding publication, to insure insertion.

Bicycles as a Side Line.

STEARNS BICYCLES

Bicycles make an admirable Side Line for the Stove and Hardware . . . Trade. STEARNS BICYCLES particularly so, for they are well advertised, universally known, up-to-date and stylish and the discounts make it . . worth while.

Write for new Illustrated Catalogue and Terms.

E. C. STEARNS & CO.,
SYRACUSE, N. Y.

IRON ROOF FOR SALE

Dimensions of building, 87 feet in width, 225 feet in length, one story in height; side walls and gables of brick; building designed for a machine shop, but owing to the failure of the purchaser, the Iron Roof Trusses are now offered for sale at a bargain. The roof is admirably adapted for a Machine Shop, Car Barn, Paper Mill, or for any other general manufacturing purposes. Apply to

THE BERLIN IRON BRIDGE COMPANY,
EAST BERLIN, CONN.

WE MANUFACTURE

PLUMBAGO CRUCIBLES

FOR MEN THAT

UNDERSTAND

using them and then they cannot be surpassed in durability; 90 heats have been attained from one crucible. Send for testimonials, quantity and sizes wanted, and we will quote you figures.

Ceylon Plumbago

PURE and HEAVY, is the only material for FACINGS if you want a bright smooth casting or for a Lubricant or Stove Polish, etc.

We keep it for sale.

Hussman Crucible Co.
ST. LOUIS, MO.

Eberhardt's Patented Sprue or Gate Cutter

Dear Sir:—The machine fills the bill; am just delighted with it.
Yours truly,
Maryland Brass & Metal Works,
Baltimore, Md.

Price Low

Send to

GOULD & EBERHARDT, NEWAKR, N. J.

"HURRY UP!"

says nearly every letter reaching us from foundrymen nowadays. "For Goodness sake, chuck that Core Compound of yours this way," says one. "We have become so used to it that we would not think of getting along without it," says another.

That is the way they talk to us. No objection on our part. We are here to do business and every progressive foundryman says we are filling the bill to a T.

We do not blame them for talking that way. Reckon if you knew what they were talking about, we would have your address here in the first mail. We sort o' think that if you did run your foundry from one end of the year to the other without losing a casting on account of bad cores (this is the way most castings are lost), that you would do some shouting yourself if you ran out of the stuff that enabled you to do so.

The Holland Compound is that kind of stuff.

It makes a porous core. It makes a strong core.

Porous enough to do away with venting; strong enough to hold with the least rodding.

We have a little Booklet on Coremaking. It tells some things about cores you may like to know. We will send you one if you say so. Send for price, delivered to your railroad station.

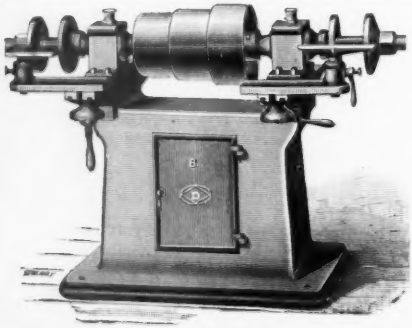
HOLLAND LINSEED OIL CO., 683 Austin Ave., CHICAGO.

BE WISE

THE GOBEILLE PATTERN COMPANY

(PROMPT AND RELIABLE)

CLEVELAND, OHIO



No. 8 GRINDER.

If you want a

Big, Heavy Grinder

For foundry work, here it is. We also have smaller and larger sizes. Our catalogue No. 19 tells all about them.

DIAMOND MACHINE CO. Providence, R. I.

It is war!

Decks are cleared for action and every gun is manned. We are ready to pour hot shot into the ranks of the enemy, and blow holes in their fortifications.

Public opinion runs entirely in one direction and is unanimous in the belief that we carry the best line of Fire Brick, Cupola Block and Molding Sands in the market.

H. S. VROOMAN, 220 W. 20th St., CHICAGO.

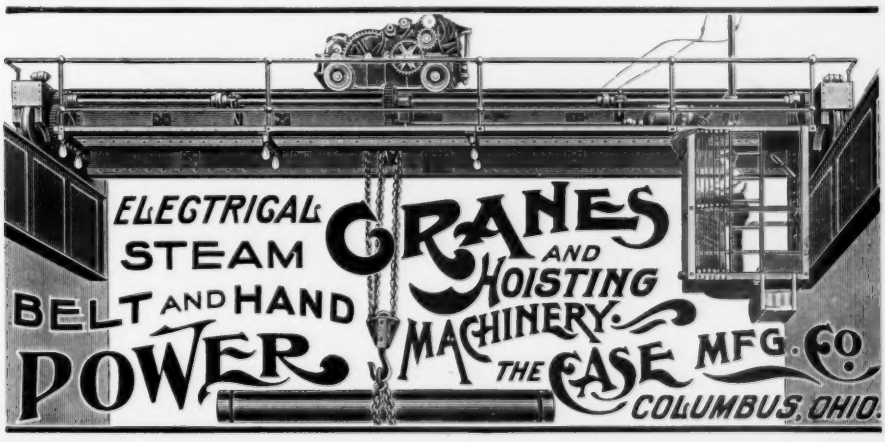
Western Agent, AYERS, THE SAND MAN.

The Best Regulated Families

Have mishaps. So does the best conducted foundries. A little sand crushes off the mold in closing, the iron scatters it here and there, and when the chipper gets to whacking his brush on the casting, he yells out: "Hey, Bill, guess we might as well haul this thing out to the boneyard to save further trouble, no good anyhow."

Don't let them do it, my boy. If your employer does not know enough to save his castings and his money, show him how. Nothing will raise your wages quicker than showing a man how he can save a dollar, and SMOOTH ON has saved single castings worth hundreds of dollars. Nobody can tell a defective casting from a perfect one after the magic SMOOTH ON has been applied to it. It is a universal remedy for all kinds of defects in castings. Blowholes, shrinkholes, slagholes and dirty castings in general, yield to its effective treatment. Get a sample and see it work.

SMOOTH ON MFG. CO., Vreeland Tompkins, Mgr., 551 Communipaw Ave., JERSEY CITY, N. J.



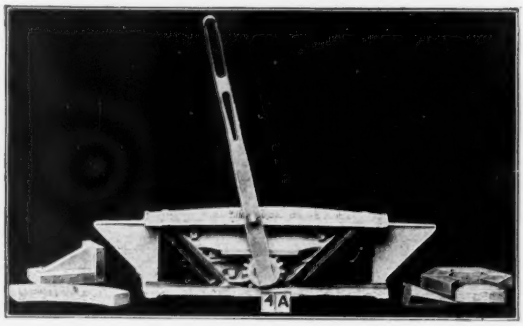
The Original Fox Universal Trimmer

Over 10,000 Sold.

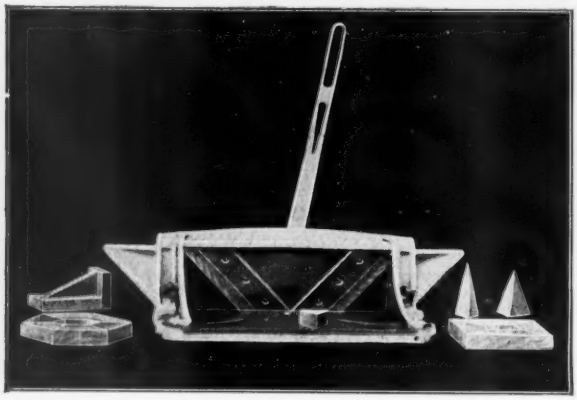
Built in 8 Sizes.

Prices, from $20 to $140.

Should be on Every Patternmaker's Bench.



No. 4 A—Improved. (Front View.)



No. 4 A—Improved. (Back View.)

Special Prices in Quantity Orders.

SEND FOR CATALOG OF NEW STYLES.

FOX MACHINE CO

850 North Front Street,

GRAND RAPIDS, MICH., U. S. A.

Substantial and Reliable

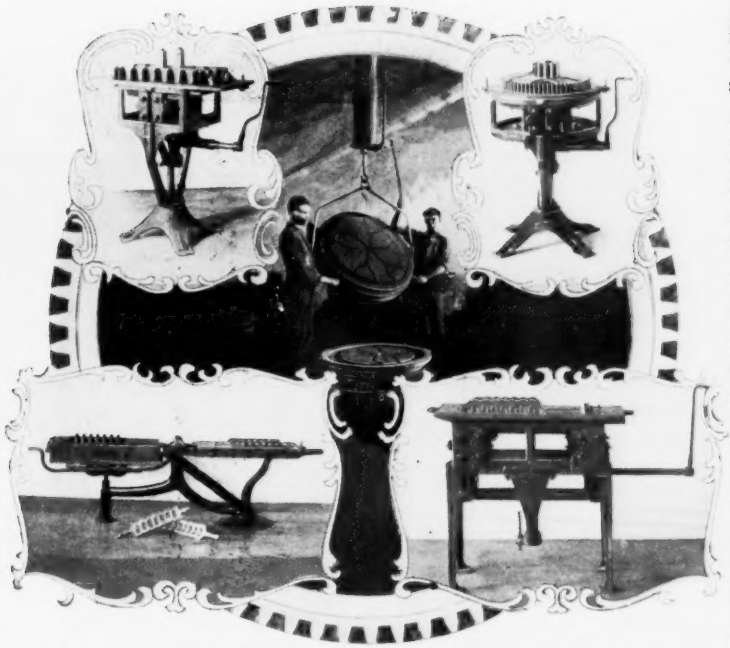
Two good old words in business phraseology; and they're all right, but not entirely satisfying. Do we not agree that we all succumb to the fascinations of EMBELLISHMENT? Why, even the miser loves the very LETTERS on the glittering coins.

Shall we tell you how to "hit two birds with one stone?" Satisfy the public taste as well as curiosity by displaying on your castings your firm name. We can furnish you just the Pattern Letters to show it up in GREAT SHAPE.

H. W. KNIGHT & SON, Drawer 1156. **Seneca Falls. N. Y.**

You can secure permission from the police

to sell your wares on the street. That saves advertising, correspondence and postage. But you can't reach the foundrymen that way. They are too busy to stand around the corners gossiping. They read a lot of papers maybe, but there is only one they read all the way through, advertisements and all—that paper is THE FOUNDRY.



Rights to use these machines for molding malleable iron or steel castings are reserved.

One Reason

why the **Pridmore Molding Machines** are superior to all others is because they are designed to meet the special conditions existing in each case. We do not build one machine and claim to cover the whole foundry trade therewith. We study what is wanted and then make the machine. Write us for . . printed matter on how to reduce the cost of molding. It will cost you nothing to find out what we can do for you.

HENRY E. PRIDMORE, 111-113 W. HARRISON ST., CHICAGO

DON'T

**

feel that you have a perfect mixture until you have used in it . . . . . .

"Pioneer"
"Antrim"
"Elk Rapids"

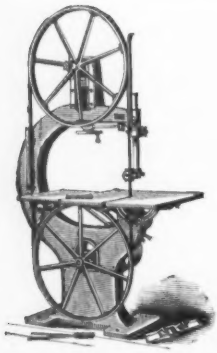
Lake Superior Charcoal Iron

These brands are graded with chemical accuracy and produce the most satisfactory results in high grade malleable castings and car wheeel mixtures.

We make a No. 1 especially adapted for strong castings.

Superior Charcoal Iron Co.,

Nos 911, 912 and 913 Michigan Trust Bldg., Grand Rapids, Mich.



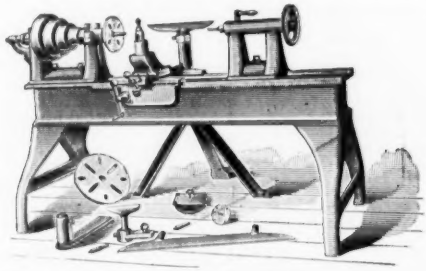
... Complete Outfits ...

FOR

Pattern Shops

STRICTLY FIRST-CLASS TOOLS.

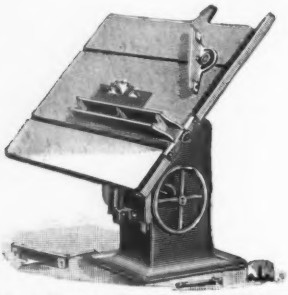
MANUFACTURED BY



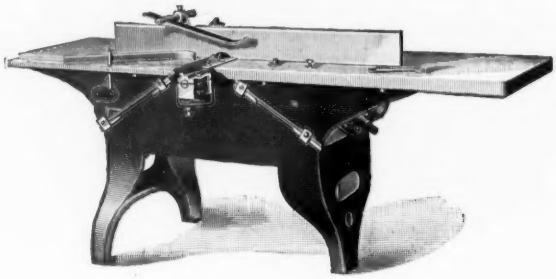
Pattern Makers' Lathes. Iron Bed with or without Carriage.

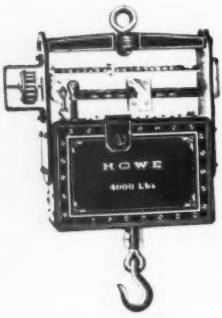
4 in. and 36-in. Band Saw Machine.

THE FRANK H. CLEMENT CO. 336 LYELL AVENUE, ROCHESTER, N. Y.



No. 1 Variety Saw Bench. All iron and steel.





Hang a Weighing Machine

on your crane and do away with handling your castings twice. These Crane Scales are made in all sizes and form one of the few real improvements that have recently been added to the up-to-date foundry. More information if you write us.

Borden & Selleck Co.

48 AND 50 LAKE STREET, CHICAGO.

The Law of Supply and Demand

holds good with you, too. There is always a dearth of cheap labor, no matter how good times we have. There are foundries that would be hard up if they made castings of gold. The Government can't give you a good job or furnish you with a money-making plant, not unless you have the ability to hold it Why not get some ability? No use in the foundry? Never was more mistaken, friend; the best always comes to the top. Why not make yourself better? Good men are always scarce, whether we have protection or free trade. THE FOUNDRY will make you infinitely better. Get it and you can laugh at the tariff. Your taxes won't be any higher, and what you will be able to make extra . . . .

is a Clear Gain.

TWO MILLS—PITTSBURGH PA. AND MAUCH CHUNK, PA.

TO MAKE CLEAN, SMOOTH, BRIGHT CASTINGS, USE THE BEST FACINGS.

THE BEST FACINGS CAN BE HAD FROM McCORMICK, PITTSBURGH, PENNA.

J. S. McCORMICK Co. Incorporated. Pittsburgh, Pa.

FOUNDRY MOLDING MACHINES, STRIPPING PLATE MACHINES, PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1875.

STOW MANUF'G CO.,

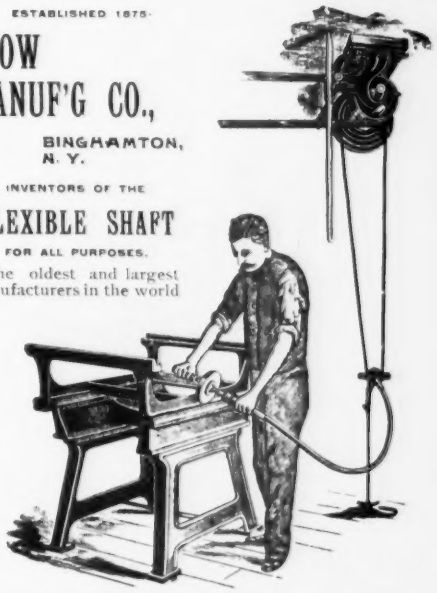
BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

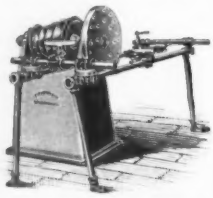
The oldest and largest manufacturers in the world



PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

WRITE US FOR CATALOGUE AND PRICES



WHY NOT

Put a Good, Modern LATHE
in your . . .

PATTERN SHOP

One that is Adapted to Your Work,
NOT A MISFIT.

WE BUILD . .
. . THE MOST **Complete Line of Such Lathes** in this Country.

We manufacture them regularly in sizes varying from 10-inch to 84-inch Swing, and can submit plans and quote prices on any size or style. We have a Special Catalogue, "F," which shows our regular line, and should be pleased to send it to you.

FAY & SCOTT DEXTER, ME., U. S. A.

J. B. & J. M. CORNELL,

Manufacturers of POOLE'S PATENT

Pressure Blowers and Exhausters

GREATER VOLUME and HIGHER PRESSURE with LESS HORSE POWER than any other type.

A COMPARATIVE TEST between one of our Blowers (referred to as Blower "A") and one made by one of the best known makers in this country (referred to as Blower "B") was made by Prof. Denton, of Stevens Institute of Technology, Hoboken, N. J.

Prof. Denton says: "The general conclusions to be drawn from the experiments are: (1st) That for pressures varying from two to fourteen ozs. and quantities of air varying from 2,500 to 6,500 cubic feet per minute, Blower A delivered from 7 to 28 per cent. more air per horse power than Blower B. (2) That over the same range of pressures and volumes, Blower A utilizes in producing pressures from 6 to 60 per cent. more velocity of its blades than Blower B."

OFFICE AND WORKS—26th St. and 11th Ave., NEW YORK CITY.

WRITE FOR PRICES

WORKS—Cold Spring-on-the-Hudson, N. Y.

DO • NOT • BE • MISLED

by persons claiming they've
got FACINGS and BLACKINGS
"as good as *Obermayer's.*"

BUY THE ORIGINAL AND BEST

Just as cheap as the imitations.

THE

S. OBERMAYER CO

CINCINNATI, O. CHICAGO, ILL.
LARIMER, PA.

"The largest and most reliable foundry supply house in the world."

MANUFACTURERS AND DEALERS

"EVERYTHING YOU NEED IN YOUR FOUNDRY."

Cupolas, Ladles, Tumbling Mills, Brass Furnaces, Iron Flasks, Crucible Tongs, East India Plumbago, Heavy Stove Plate Facings, Founders' Perfect Wash, Shovels, Riddles, Bellows, Wire Brushes, Soft and Hard Brushes, Bench and Floor Rammers, Molding Sands, Fire Brick, Cupola Blocks, Fire Clay, Core Wash, Molders' Tools, etc., etc. . . . . .

Send for our Catalogue No. 26—it will tell
you all about them.

J. W. Paxson Co

MANUFACTURERS OF

Foundry Equipment and Foundry Supplies

Also Manufacturers of

Foundry Facing

DIGGERS AND SHIPPERS OF

MOLDING SAND For Iron, Steel and Brass Foundries.

PHILADELPHIA, PA.

A Word

as to

Joseph Dixon Invented the Plumbago Crucible

DATE OF INVENTION
1826.

Dixon's Crucibles have been in the Market SEVENTY YEARS.

Dixon's Plumbago Crucibles

Dixon's Crucibles are Standard all over the GLOBE.
Dixon's Crucibles are used in every country on the Globe where metals are melted.
Dixon's Crucibles have the highest records for HEATS.
Dixon's Crucibles are made to get

BEST RESULTS WITH THE LEAST COAL.

Dixon's Crucibles are made of many mixtures to suit all kinds of work.
Dixon's Crucibles are made special for Steel Melting.
Dixon's Crucibles are made special for Nickel Melting.
Dixon's Crucibles are made special for Brass Melting.
Dixon's Crucibles are made special for Composition Melting.
Dixon's Crucibles are made special for Phosphor Bronze Melting.
Dixon's Crucibles are made special for German Silver Melting.
Dixon's Crucibles are made special for the Melting of Precious Metals.

In ordering you will be benefitted by mentioning the kind of Metals melted. Write for pamphlet **"How to Use Plumbago Crucibles."** The best are the cheapest, as they must stand the punishment of high heat and much wear and tear. The "Dixon" records in average efficiency, in general good behaviour and in volume of sales, far in the lead.

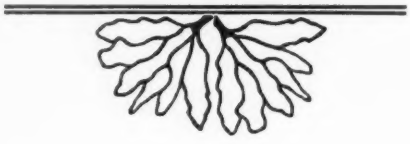
Jos. Dixon Crucible Company,

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

537=39 West 27th St.,
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY, N. Y.
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COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO, ILL.

Crucible.

Crucible

Dipper.

Cover.

Stopper.

Crucibles

For melting Steel, Brass, Copper, Gold, Silver, Nickel and Metals and Alloys of Every Description; SmallCrucibles for making Assays and fine pure Plumbago for lubricating, etc.

We are practical workmen and have studied the requirements of the different metal works in this country, as well as in Europe. We also work strictly by chemical analysis, giving a uniformity at all times never before approached in this or any other country.

We make All Sizes, from 8 oz. to 2 ton Capacity.

ROBT. J. TAYLOR & SON,

1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

P. C. COCHRAN, PRESIDENT.
J. H. WURTZ, SECRETARY.

J. R. LAUGHREY, TREASURER.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. 3500 Tons Daily Capacity.

300 30-TON GONDOLA CARS — 50 30-TON COKE CARS.

Shipments of Coal commenced November 23 1893.
" Coke " August 29, 1894.

Coal shipped during	1893	3,750	Tons.
Coal and Coke shipped during	1894	204,500	"
" " "	1895	370,000	"
" " "	1896	353,000	"
" " "	1897	750,000	"

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

A "Spring Fever" Card This

As an indication that what we say in these cards "is the truth, the whole truth and nothing but the truth," as the Squire says, it is our custom from time to time to open a page of our order book to you. We generally do this when we are too lazy to write a regular ad. Spring fever! So here are some of the concerns who are getting Ridgway machines. Note the kind of 'em:

The Sessions Foundry Co., Bristol, Conn.—This is the largest and finest foundry we were ever in. We are making them three cranes.

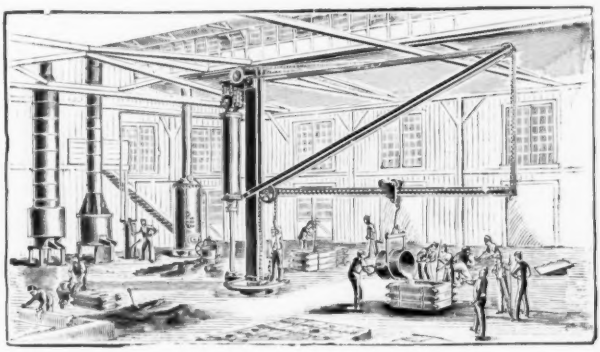
The Benj. Atha & Illingworth Co., Newark, N. J.—One of the largest and best of the steel plants. We are making them eight cranes.

Walker, Pratt Mfg. Co., Boston, Mass.—You just ought to see this plant. New and fine. Every molder has his own bath room and all that kind of thing. Nine machines here.

Goldie & McCulloch Co., Galt, Ontario, Canada.—Largest establishment in Canada. This is their second order.

Hazard Mfg. Co., Wilkesbarre, Pa.—Already are using Ridgway Cranes. Old story—are back after more, yelling "hurry."

Ramapo Iron Works, Hillburn, N. Y.—Make railroad appliances. Their second order, too.



5-ton Steam Hydraulic Crane in a Foundry.

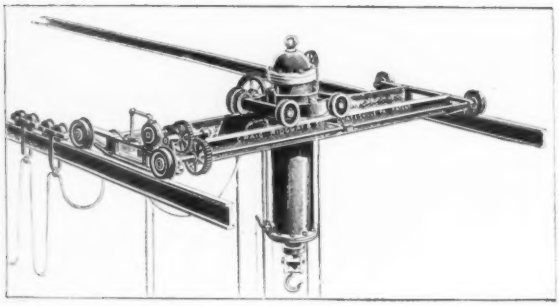
G. M. Pfaff, Kaiserlautern, Germany.—The largest sewing machine factory in Germany. They come across the ocean to get the best.

Portland Gas Co., Portland, Maine.—This is one of the "Please take the Elevator" fellows.

United Gas Improvement Co., Philadelphia, Pa.—This is about their 15th order, I think.

And a whole lot more if we just had the room. Say, brother, honestly now, don't you think a machine that will bring names like that to a single page of an order book is worth looking into? Don't you want to save money, too?

Air Hoists. Just One



That's all we solicit from you. An order for **just one.** Hang it up and try it, and you need no words from us. We use a little oil in the piston rod, and you don't have to concern yourself about broken arms or spoiled work. You no longer have an air gun. Don't buy an air hoist until you get our circular.

"PLEASE TAKE THE ELEVATOR."

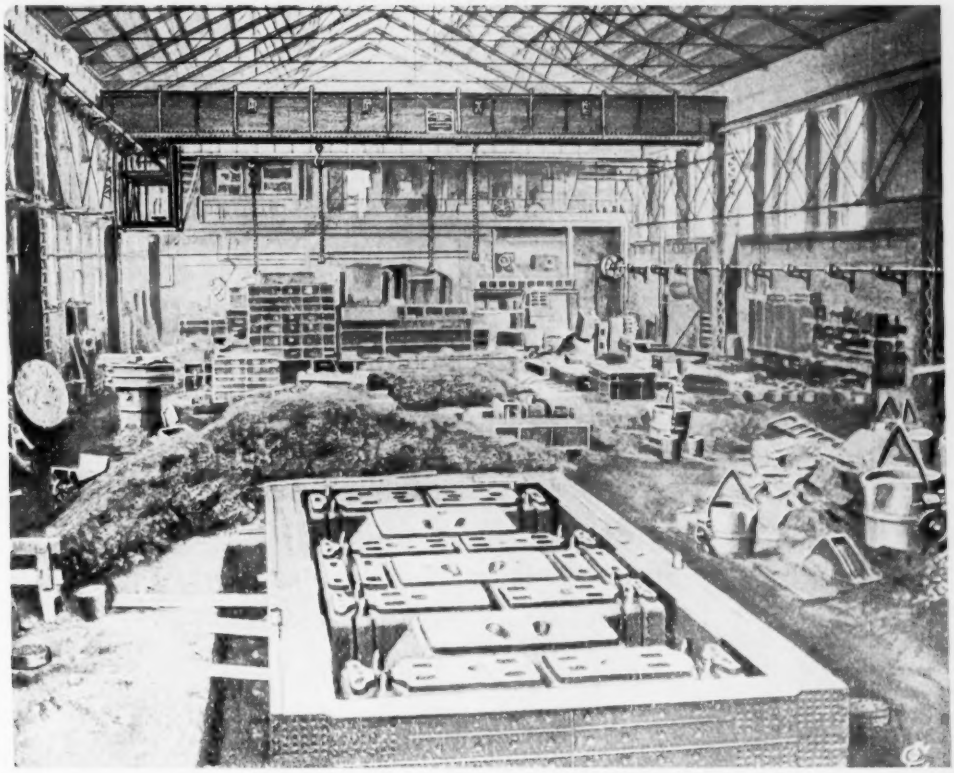
Just the Machine you want.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

William Sellers & Co. Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



We present herewith a view of our main foundry, which shows that the handling of large **Cores, Castings and Copes** is effected by **Two Traveling Cranes**, one of 30 tons capacity operated by power, the other of 26 tons capacity operated by three electric motors. These Cranes displaced two 50-ton Jib Cranes operated by steam power, one 25-ton Jib Crane and four 15-ton Jib Cranes formerly required in the foundry.

It will be observed that the entire floor space is thus available. The delicate operation of lifting the cope of the green sand mold 21 feet long, shown in the foreground, and of setting the large and complicated cores, was quickly and safely performed by one Traveling Crane, operated by one man in the cage. The casting which was made in this mold weighed, after dressing, 61,000 pounds.

We constructed the first Traveling Cranes for use in our own shops in 1853.

We were the first to advocate and introduce **High Speed Traveling Cranes**, say with a bridge travel up to 200 feet per minute, trolley travel up to 100 feet per minute, hoisting speeds up to 40 feet per minute; all of which is quite practicable for all classes of work with our features of construction, and while crane users—foundrymen particularly—were skeptical of the practicability of high speeds for foundry service, such speeds, and even greater speeds, have come to be demanded by all classes of users.

We are prepared to meet all possible requirements as to capacity, speed, etc., etc., and any method of driving, and with the **assurance in each case of SAFETY and ECONOMY in working and with least cost for maintenance.** Correspondence on the subject is solicited.

Take a Tumble

And get from under the old delusion that sand is sand.

A suitable molding sand saves the molder's time. Poor sand must be rammed very carefully and well vented. Careful ramming takes a lot of time, so does venting.

A suitable sand gives an elegant appearance to the castings. A good looking casting is a standing advertisement for the man who made it, so is a poor one.

We make a business of digging molding sand exclusively. Not being a side line with us, we give it the attention it deserves. We must please our customers or go out of business.

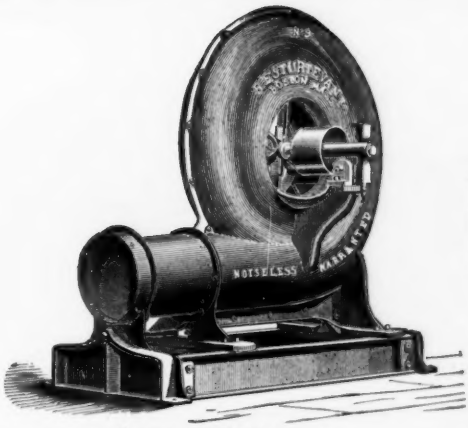
For heavy machinery molding in green sand, we recommend **"OUR Zanesville, No. 4."** We showed an illustration of what this sand will do in the April issue of THE FOUNDRY. Look it up; it is a stunner.

Ayer's Sand is the standard between the Alleghenies and the Rockies for all classes of work.

AYERS, the Sand Man,
ZANESVILLE, OHIO.

Western Agent—
H. S. VROOMAN,
220 W. 20th St., CHICAGO.

P. S.—Our Crude Plastic Fire Clay is the best in the land, quality considered. We guarantee it.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

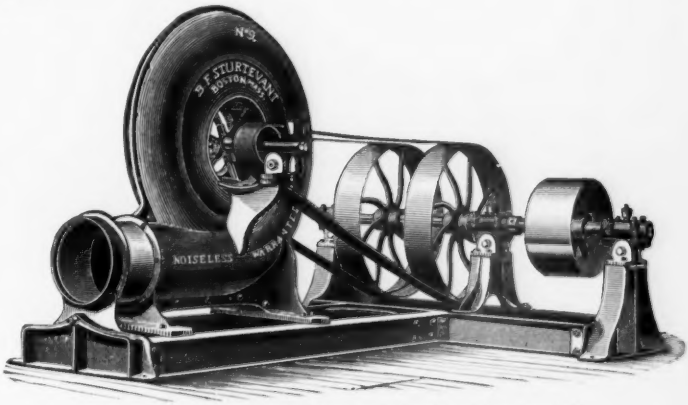
—FOR—

Cupola Furnaces and Forge Fires.

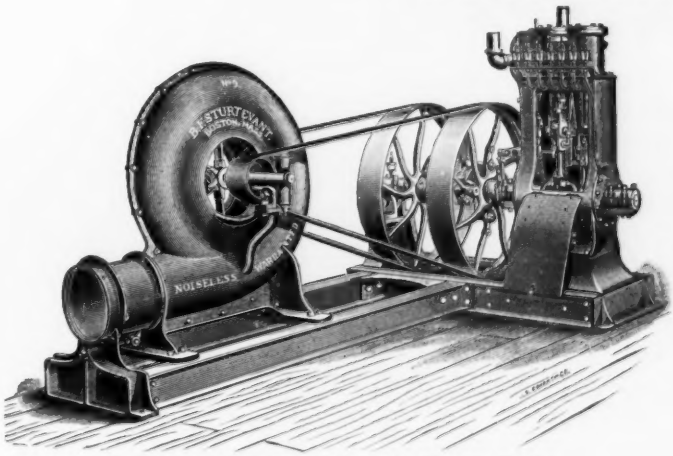
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

B. F. STURTEVANT CO.,

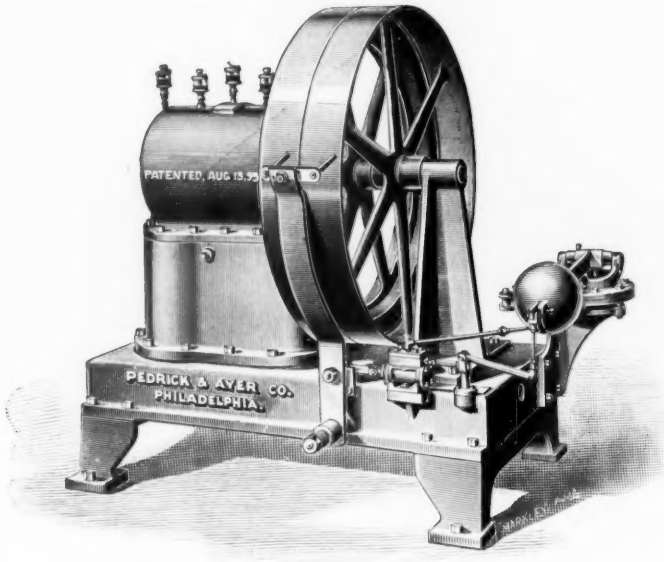
BOSTON, MASS.

131 Liberty Street, NEW YORK, 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.

Automatic Compound Belt Air Compressors.

PATENTED AUGUST 13TH 1895.



Straight Lift Hoist. **Built in two sizes, Nos. 1 and 2.**

No.	Size of Cylinders in inches	Revolutions per Minute.	Cubic Feet of Free Air	Horse Power Required.	Size of Pulleys in inches	Shipping Weight of Compressor	Floor Space in inches	Telegraphic Symbol
1	11x 6 6x 6	100-160	32- 50	2-3½	40x5	2875 lbs.	60x40	Parian
2	1:x10 8x10	90-120	90-120	9-15	60x6	5370 lbs.	76x60	Parish

AIR HOSE COUPLING

For ½ inch, ¾ inch and 1 inch Hose.

These Compressors will compress more air at less cost than any other make, requiring no attention other than oiling; entirely automatic in action, stopping and starting as air is required. Specially adapted for foundry use. Can be run in series, if so, no stoppage impossible.

Horizontal Air Lift for low ceilings; for general lifting, quick in action and under perfect control of operator.

Straight Air Lift for foundry purposes when equipped with retaining and releasing valve, will hold the load whether heavy or light, in the desired position, as in case of lifting a ladle of molten iron and pouring it or raising a flask to knock out the sand. It can neither ascend or decend as long as connected to air supply.

Air Hose Couplings are designed to do away with long lines of hose. By having suspended along the air line a number of hose equipped with this device, connections can instantly be made or disconnected, allowing one hoist to serve in several places. Each size made in duplicate. Containing a shut-off valve.

Send for circulars and details to Pedrick & Ayer Co., Pneumatic Department.

PEDRICK & AYER CO.

SPRING GARDEN STATION, PHILADELPHIA, PA.

Manning, Maxwell & Moore, *Sole Agents*, 11-113 Liberty St., New York ity. 60 South Canal St., CHICAGO, ILL. 424 Telephone Bldg., PITTSBURG.

DIRECTORY OF LEADING PIG IRON DEALERS.

MATTHEW ADDY & CO.
CINCINNATI. ST. LOUIS.
Agencies,
Chicago, Detroit, New York,
Philadelphia. Pittsburg.

CLINTON IRON & STEEL CO.
Manufacturers of the
CLINTON INSPECTED FOUNDRY IRON
CELEBRATED "CLINTON" SOFTENER
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(Limited)
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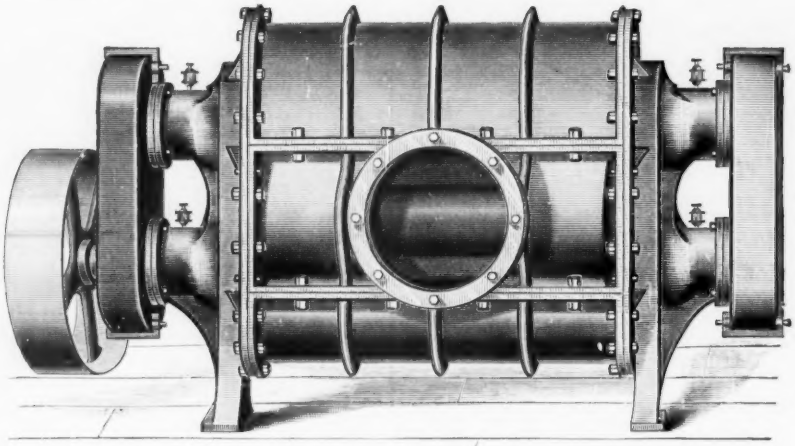
PIG IRON and COKE,
Columbus, O. St. Louis, Mo.

SUPERIOR CHARCOAL IRON COMPANY,
Lake Superior Charcoal
PIG IRON,
General Office,
913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

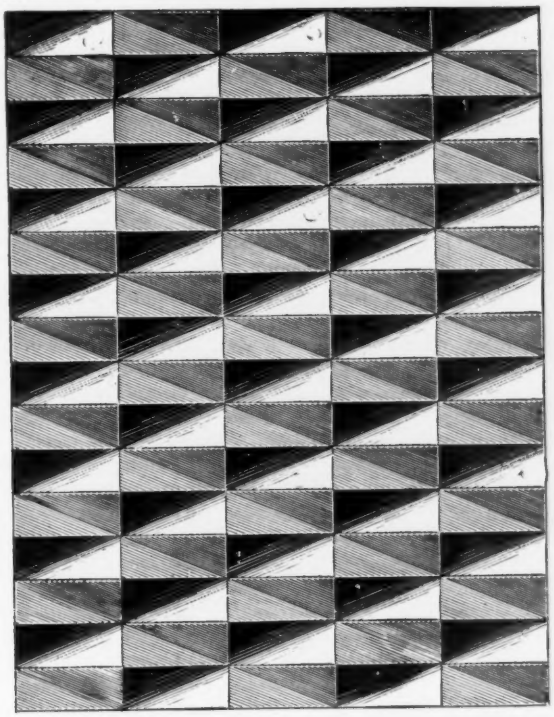
Exhausters for Hot Gases

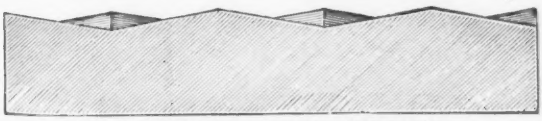
The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co.,

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: **Frazer & Chalmers, Inc.** CHICAGO, ILL., and BRANCH HOUSES.





The above cut shows exact size of Diamonds.

Diamond Pattern Lumber,

—FOR—

DOOR SILLS, PLATFORMS, STEP PLATES, Etc.

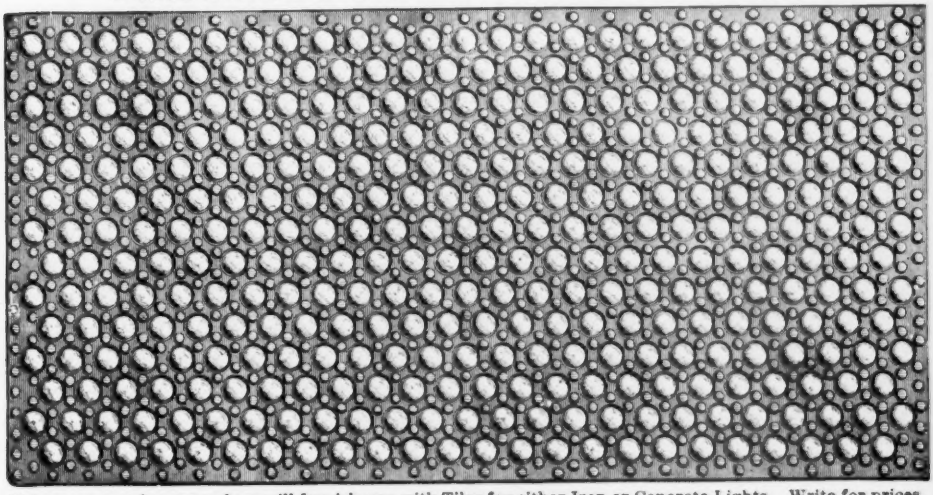
This Patent Lumber is made by a Special Machine invented by us, the ONLY Machine of its kind, and each piece will match PERFECTLY with all other pieces, by "joining" the edges to the centre, lengthwise, or any row of Diamonds.

Size of each piece, 8 feet long by 6 inches wide and ¼ inch thick. Price 10 cents per running foot of 6 inches in width, NET CASH crated and delivered f. o. b. Chicago, in orders of not less than 6 pieces. Send for sample.

BROWN BROS. MFG. CO.

Cor. Clinton and Jackson Sts. Chicago.

PRISMATIC SIDEWALK LIGHT TILE.



Make your own frames and we will furnish you with Tiles for either Iron or Concrete Lights. Write for prices.

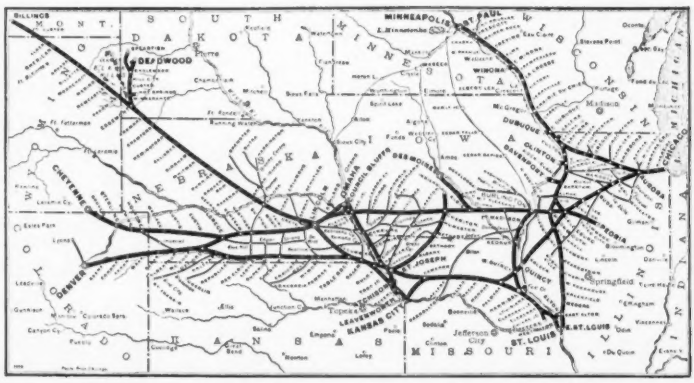
BROWN BROS. MFG. CO.,

Cor. Jackson and Clinton Sts. CHICAGO.

A WORD TO MANUFACTURERS

The Industrial Department of the Chicago, Burlington & Quincy Railroad is organized for the purpose of aiding in the location of factories along the line of this road. No section of the country has greater resources to attract the manufacturer. Cheap coal and an abundance of raw material. Many cities on our line offer liberal inducements to aid in establishing new plants.

We solicit correspondenee, and will assist manufacturers seeking a new location in every way possible. *GEO. H. ROSS, Superintendent,*
209 Adams St., CHICAGO, ILL.



A MAP OF THE BURLINGTON ROUTE

ITS 7500 MILES OF ROAD REACH EVERY IMPORTANT CITY BETWEEN THE GREAT LAKES AND THE ROCKY MOUNTAINS.

Established 1872. Incorporated 1895.

McCullough-Dalzell Company

PITTSBURGH, PA.

CRUCIBLES for Brass Melting .

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CRUCIBLES for All Purposes . .

CRUCIBLES of All Sizes . . .

STOPPERS, Twenty-one Styles .

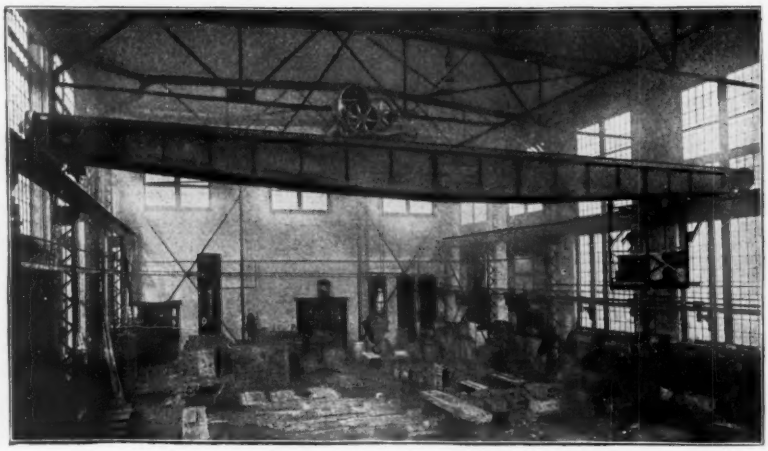
LIDS, COVERS, CAPS, . . .

PHOSPHORIZERS . . . . .

PLUMBAGO FINE DUST . . .

ALL ARTICLES CONTAINING PLUMBAGO

Three Motor Electric or Compressed Air Traveling Cranes



ELECTRIC THREE MOTOR TRAVELER, 50-FOOT SPAN.

Modern Cranes are necessary to produce work economically.

JIB CRANES (HAND OR POWER), AIR HOISTS

THE LEADING FOUNDRIES USE THE WHITING CUPOLA.

Made in 14 Sizes.

COMPLETE FOUNDRY EQUIPMENTS FURNISHED.

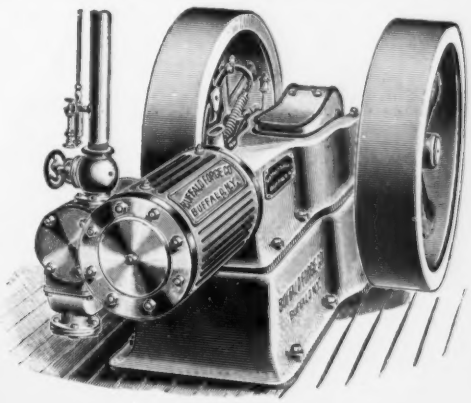
THE AVERY MOLDING MACHINE.

Prices on application.

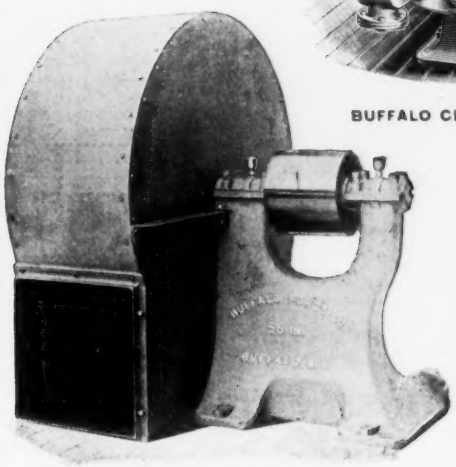
SEND FOR CATALOGUE.

Whiting Foundry Equipment Co.

Works, HARVEY, ILL. (Chicago Suburb.)



BUFFALO CLASS "A" AUTOMATIC ENGINE.



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Tumbling Barrel Exhausters are easily applied, thoroughly efficient, and change casting cleaning rooms from a death-dealing pestilence to a comfortable working apartment.

Send for details.

Our 400 Page Catalogues tell all about these machines, applications, etc.; also Fan System of Heating Foundries, etc.

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Buffalo Forge Company,

BUFFALO, N. Y.

BUFFALO CUPOLA BLOWER.

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THE FOUNDRY

The only foundry paper published in the world, and an authority on all matters pertaining to the foundry business.

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" " Universal Postal Union, 1.75 "

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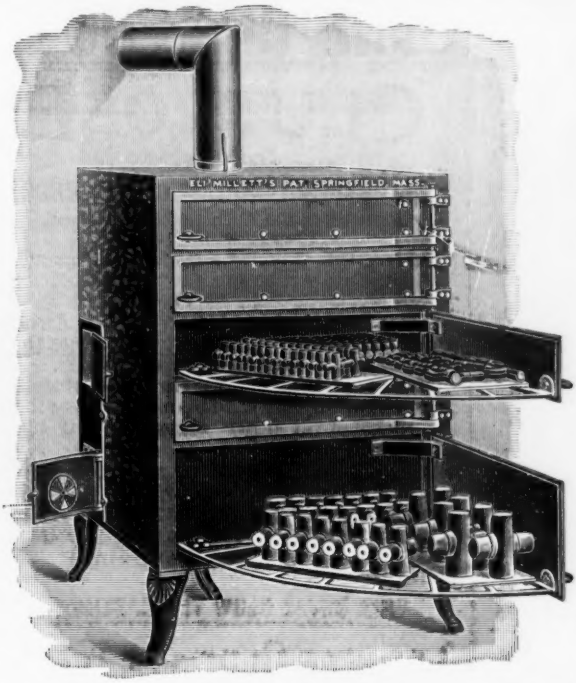

Millett's Patent Core Oven

Double Doors,
One closing the oven when the other is open.

THE BEST IN THE WORLD.

No Foundry using small Cores can afford to be without it.

Over two hundred in use.

Send for our new Catalogue giving names of those using them.

Millett Core Oven Co.

BRIGHTWOOD, MASS.

For Sale by THE J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Chicago, Ill.

Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

MANUFACTURERS OF

"CLINTON" AND "HECTOR"

INSPECTED FOUNDRY IRONS . . . . .

ALSO

Sole Factors for DUNBAR STRONG IRON

In New York and New England.

FURNACES, PITTSBURGH.

NEW YORK OFFICE, No. 15 Cortlandt St.

Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

ESTABLISHED 1854.

Brooklyn Fire Brick Works

CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

Send for Illustrated Catalogue and Prices.

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The Coburn Patent Trolley Track

PARLOR DOOR HANGERS.

The adjustment is in the Track and not in the Hanger, as are others.

☞Send for Book.

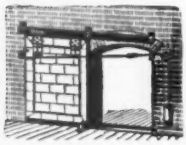
The Coburn Patent Trolley Track

BARN DOOR HANGERS.

Impossible for door to jump the track. Very simple and cheap to apply.

☞Send for Book.

The Coburn Patent Trolley Track



FIRE DOOR HANGERS.

Recommended and adopted by fire underwriters all over the United States.

☞Send for Book.

The Coburn Patent Trolley Track

Overhead Tramway

Furnished complete with straight and curved track, switches, frog brackets, single and double carriers.

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The Coburn Patent Trolley Track

—AND—

Patent Rolling Ladder Systems

Over 10,000 in use in the U. S. Roll suspended from ceiling or facing the shelves.

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The Coburn Trolley Track Mfg. Co.,

HOLYOKE, MASS.

CORE COMPOUND

GLUTROSE

(Trade Mark.)

The Universal Liquid Core Compound

Patented in the United States, England, France and Belgium.

GLUTROSE was invented and is manufactured by a practical foundryman of many years' experience, It has been used in the Pennsylvania Railroad Foundry at Altoona and other large foundries for the past three years with the most satisfactory results.

It is cheaper and better than flour, rosin, oil, molasses or any other compound in use; takes the place of all other materials and never varies in quality.

WILL MAKE FIRST-CLASS RADIATOR CORES WITHOUT RODDING.

WHY PAY 30 to 40 CENTS FOR LINSEED OIL WHEN THE SAME RESULTS CAN BE OBTAINED FOR HALF THE MONEY?

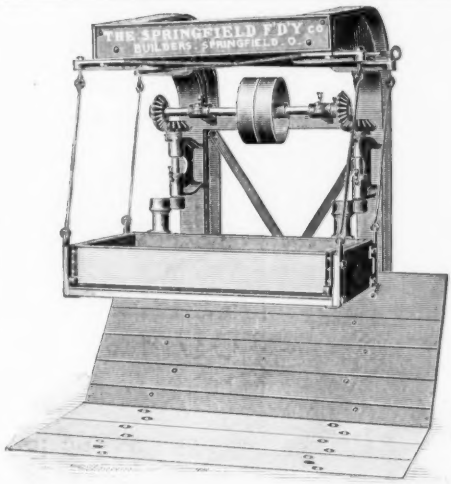
WILL NEVER BLOW THE CASTINGS.

AMERICAN GLUTROSE WORKS

Sole Manufacturers.

Office: PENN MUTUAL BUILDING,

No. 925 Chestnut St., Philadelphia.



THE PERFECT

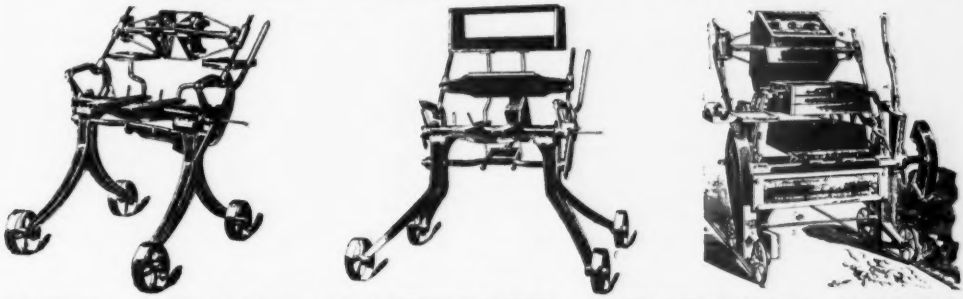
Sand Riddling Machines

BOTH HAND AND BELT POWER.

These are the Best, Simplest, Most Durable and Most Easily Operated Sand Riddling Machines made. For full particulars and references, address,

The Springfield Foundry Co., SPRINGFIELD, OHIO.

FARWELL'S **MOLDING MACHINES** Send for Catalogue



THE ADAMS COMPANY, DUBUQUE, IOWA

Estate of Oscar Barnett. BRUEN, HAMILTON and McWHORTER STREETS NEWARK, N. J.

Manufacturers of Supplies for BRASS FOUNDRIES.

<Standard> Flask.

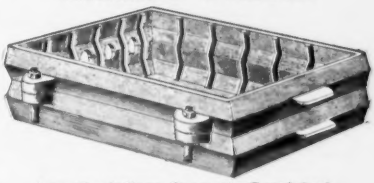
Finished Hardware Specialties to Order.

Not milled with Emery Wheels, but accurately planed

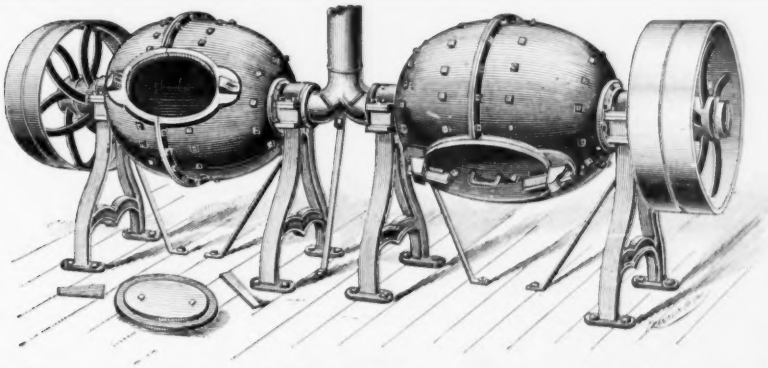
Which is your choice. We make both styles.

ESTABLISHED 53 YEARS

Ribbed Flask.



Low Quotations Promptly Furnished.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does doublethe work of any other with less noise andpower. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

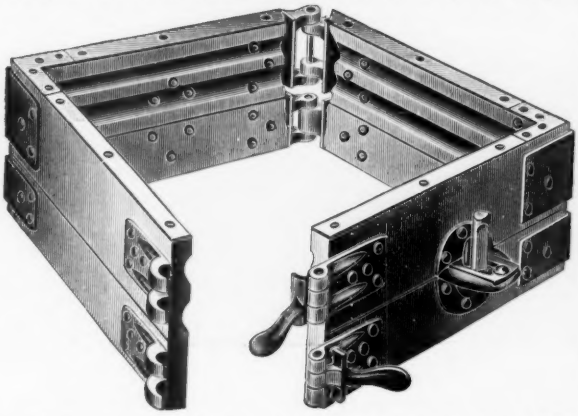
Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

205 RIVER STREET, FREEPORT ILL

Eureka Improved Snap Flask



A Snap Flask that is always reliable. Heavily bound on both edges with band iron; strong, durable. We sell the "Eureka" cheaper than foundrymen can make *any* flask for, much less such a flask as this. Write for discounts.

No. 1—Hardwood, 1¼ in. Stock, $2.75 each. No. 2—Whitewood, 1¼ in. Stock, $2.50 each.

C. H. Green & Co. ✳ SYRACUSE, N. Y.

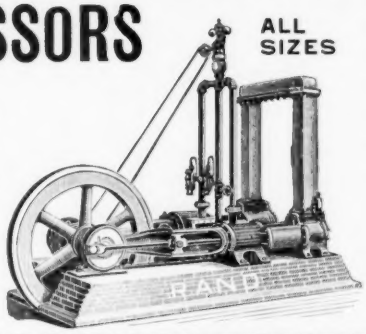
RAND AIR COMPRESSORS

FOR FOUNDRIES.

SIMPLE. DURABLE. ECONOMICAL.

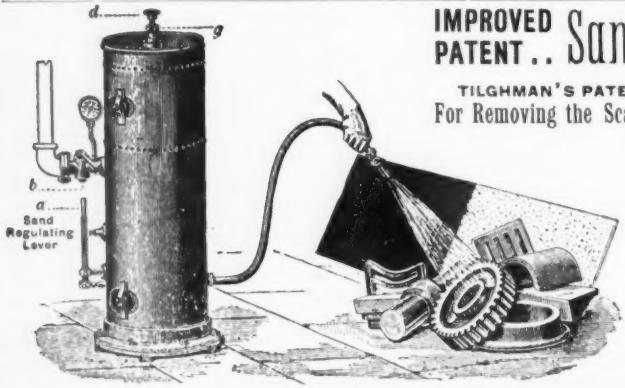
Our **Duplex Compressor,** Compound Air Cylinders, with Inter-Cooler and Compound Steam Cylinders, with Meyer Cut-off Valves, is the best construction for small and medium sizes.

ALL SIZES



RAND DRILL CO.

Don't forget our Rock Drills. 100 Broadway, NEW YORK.



IMPROVED PATENT.. # Sand Blast Machinery

TILGHMAN'S PATENTS. MATHEWSON'S PATENTS.

For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

WARD & NASH,

SOLE AGENTS,

35-37 So. Canal Street, CHICAGO.

23-25 Purchase St., BOSTON.

Send for Catalogue.

Heyl & Patterson

ENGINEERS AND CONTRACTORS,

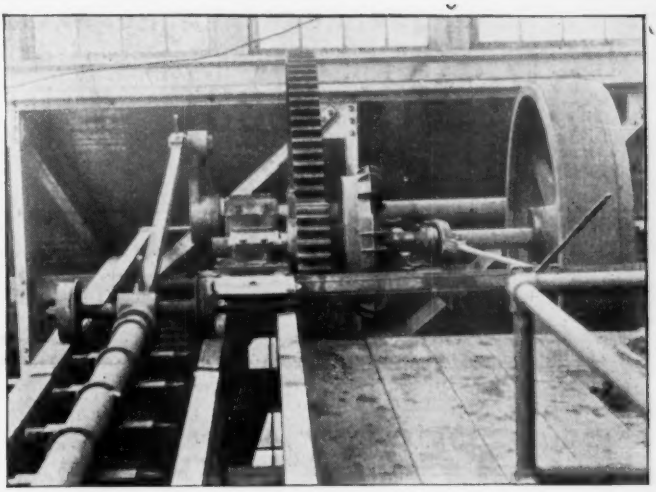
PITTSBURG, PA.

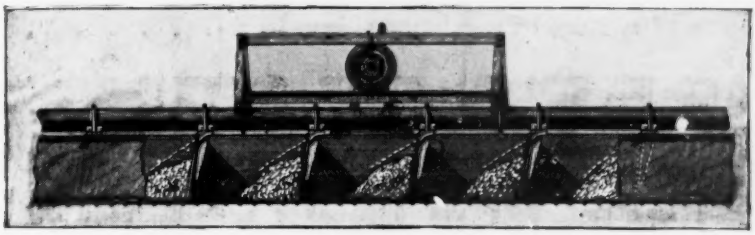
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

OTHERS MAY OFFER

New Fangled Substitutes for Lycopodium

BUT GOOD, OLD-FASHIONED

NEW ENGLAND CHARCOAL FACING

will do just as good work, is not injurious to inhale, and cheapest of all. The fact you have used common charcoal, that was not right, is no reason you should not try ours. We guarantee every barrel. Let us send you a sample and tell you about it.

SPRINGFIELD FACING CO., SPRINGFIELD, MASS.

MICHIGAN CENTRAL

"The Niagara Falls Route."

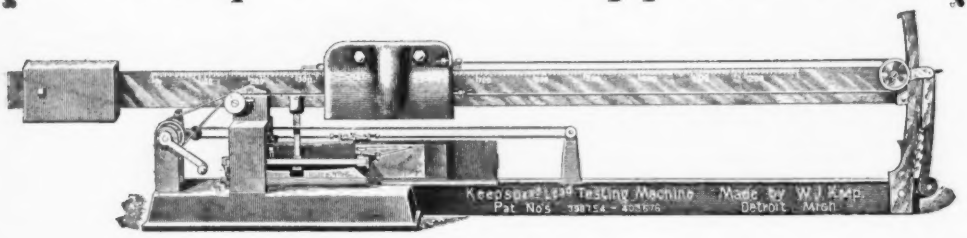
A FIRST CLASS LINE FOR FIRST CLASS TRAVEL.

ROUTE OF THE "North Shore Limited."

"As near perfection in the way of construction, appointments, service and able management as can be conceived in modern railroading.—*Extract from report of Railroad Commissioner, State of Michigan.*

O. W. RUGGLES, G. P. & T. Agent, CHICAGO.

"Keep's Test" Apparatus.



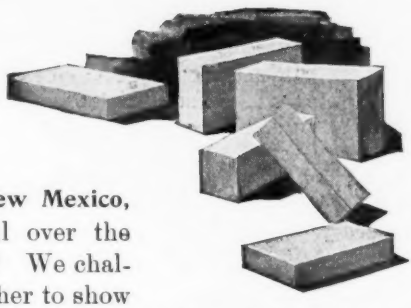
PROSPERITY consists in making money when selling castings at the present low prices.

HOW? Adopt modern devices. Some save $10.00 per day in the cost of mixture by regulating silicon by . . . . . .

"KEEP'S TEST."

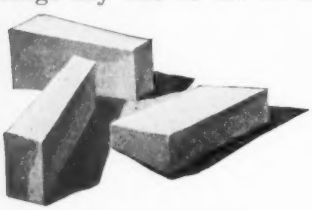
TO SAVE MONEY IN YOUR OWN FOUNDRY, ADDRESS **W. J. KEEP, Detroit, Mich.**

Just as Good as "Franklin Crown!"



Did it ever occur to you that the man who makes that statement is an **imitator** and his goods a **counterfeit?**

DID YOU KNOW that we are shipping "**Franklin Crown**" **Fire Brick** to **South Africa, Southern California, Old Mexico, New Mexico, Texas, Washington, D. C., Georgia,** and all over the United States, wherever Fire Brick are used? We challenge any one or all of these **imitators** together to show such a record. Do you think this could be done if these bricks were anything but the **best in the land?** And every other brand of brick handled by us is equally as good of its Class, viz: "**Wigton Steel,**" "**Sligo,**" "**W**" and "**Standard,**" also **Cupola Blocks, Molding Sand,** etc.



Garden City Sand Co., * * SECURITY BUILDING, CHICAGO.

Bicycles as a Side Line.

STEARNS BICYCLES

Bicycles make an admirable Side Line for the Stove and Hardware . . . Trade. STEARNS BICYCLES particularly so, for they are well advertised, universally known, up-to-date and stylish and the discounts make it . . worth while.

Write for new Illustrated Catalogue and Terms.

E. C. STEARNS & CO.,
SYRACUSE, N. Y.

Iron Roof for Sale

Width of building, 155 feet out to out; divided into a center span 66 feet, with a wing on each side 43 feet, 6 inches; total length of the building, 350 feet. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an Iron Foundry, but owing to the failure of the purchaser, is now offered for sale at a bargain. Is admirably adapted for a Foundry for light or heavy castings, Machine Shop, Car Barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.

Apply to

The Berlin Iron Bridge Company,
EAST BERLIN, CONN.

WE MANUFACTURE

PLUMBAGO CRUCIBLES

FOR MEN THAT

UNDERSTAND

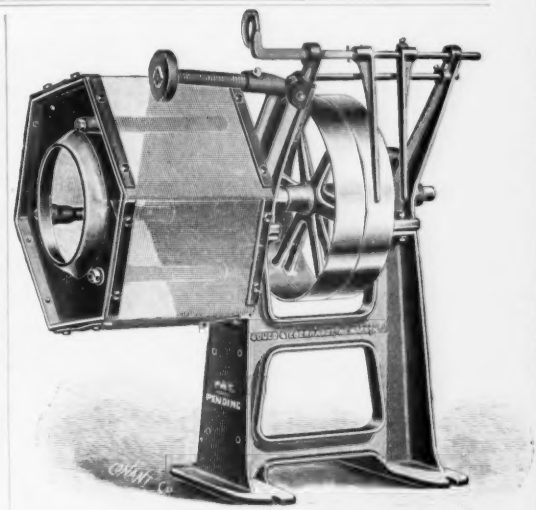
using them and then they cannot be surpassed in durability; 90 heats have been attained from one crucible. Send for testimonials, quantity and sizes wanted, and we will quote you figures.

Ceylon Plumbago

PURE and HEAVY, is the only material for FACINGS if you want a bright smooth casting or for a Lubricant or Stove Polish, etc.

We keep it for sale.

Hussman Crucible Co.
ST. LOUIS, MO.



EBERHARDT'S IMPROVED AUTOMATIC SAND SIFTER.

Messrs. Gould & Eberhardt, Newark, N. J.:

GENTLEMEN—As to the working of the Sand Sifter, it is *more than satisfactory*. After using a shaker, which not only shook the sand, but also shook itself apart periodically, it is a great relief, doing its work *quietly* and *thoroughly*, and we shall be pleased to recommend it to anyone you may refer to us. Yours truly,

BELL & FYFE FOUNDRY CO.

GOULD & EBERHARDT, NEWARK, N. J.

Taffy

is what some people are giving you when they talk about "blue sky" and plumbago.

We don't say anything to take your mind off of the real subject.

When we talk about plumbago, we confine ourselves to what **"Kelly's Plumbago"** will do.

"As good as Kelly's," some of our "Direct," "Ceylon," "In Bond" competitors say. That shows **"Kelly's Plumbago"** must be pretty near the top.

A dollar's worth of **"Kelly's Plumbago"** will go farther than a dollar's worth of any other man's plumbago.

Just like one kind of coal will evaporate 12 pounds of water, while another will only get away with 6, so one kind of plumbago will do more work than another. **"Kelly's Plumbago,"** besides being A1, is cheap when the work it does is considered.

T. P. Kelly & Company,

MILLS AT . . Reissing, Pa. Bloomsbury, N. J.

WESTERN OFFICE and MILLS: 121-127 N. Ada Street, cor. Kinzie, CHICAGO.

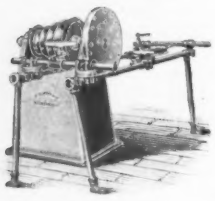
284 Pearl St., NEW YORK, N. Y.

CINCINNATI, HAMILTON & DAYTON Ry

THE SHORT LINE BETWEEN CINCINNATI. INDIANAPOLIS, DAYTON, LIMA. TOLEDO and DETROIT.

D. G. EDWARDS, Pass. Traffic Mgr., CINCINNATI, OHIO

A Pattern Pattern Maker



needs good tools, especially lathes, and there might be something in the fact that FAY & SCOTT have made Pattern Makers' Lathes for years and that these lathes are found the world over installed in the best shops. Lathes from 10 to 84 inch swing. Better write to-day and then you won't forget.

Fay & Scott, Dexter, Maine, U. S. A.

Rights to use these machines for molding malleable iron or steel castings are reserved

...THE...

PRIDMORE

MOLDING MACHINE

is built to order only.

It is built to your measure and therefore fits you.

It is constructed only after we know what kind of work it is intended to do.

No guess work, no alterations, no adjusting when you get the **Pridmore.**

It won't cost you any more to get a **Pridmore** made to order than it does to buy a "ready made" cheap affair, calculated for the use of everything. The Special Machine, like the special man turns out the most work. Let us tell you what a **Pridemore** special will do for you.

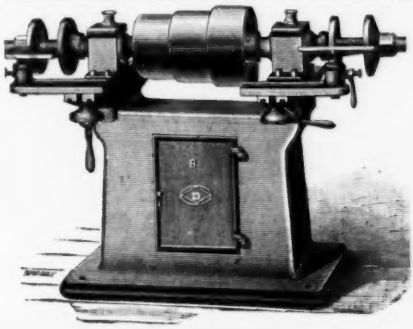
HENRY E. PRIDMORE, 111-113 W. HARRISON ST., CHICAGO

BE WISE

THE GOBEILLE PATTERN COMPANY

(PROMPT AND RELIABLE)

CLEVELAND, OHIO



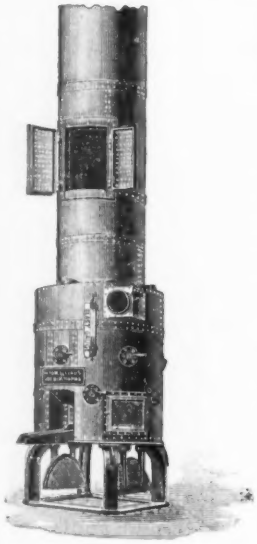
No. 8 GRINDER.

If you want a

Big, Heavy Grinder

For foundry work, here it is. We also have smaller and larger sizes. Our catalogue No. 19 tells all about them.

DIAMOND MACHINE CO. Providence, R. I.



A Cupola Bargain

A few years ago a large plant was erected in Detroit by a concern which intended to manufacture car wheels and car equipment. It was never put in operation, and we now offer for sale a Colliau Cupola; diameter of shell, 75 inches; height from bottom plate to top of stack, 40 feet. It has been well taken care of and stored in a suitable place and is in as perfect condition as when purchased.

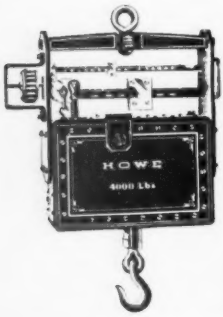
The Colliau Cupola has never been excelled as an economical melter, as is shown by the large number in use and the imitations which have been made of its construction. The chance to obtain a good cupola at half price is not an everyday occurrence. To hurry the sale, we have made the price

$375 F. O. B. Detroit.

We also have for sale a number of cupola bricks. Your own price takes them.

F. T. DeLONG,

93 Griswold Street, DETROIT, MICH.



Two Birds at One Shot

Two labors accomplished in the same time as one, is the way things go when you hang a Weighing Machine on your Crane and check up the weight of your castings as they leave the shop, instead of spending your time and power carrying everything to a stationary scale. These machines are made in all sizes and you can have just what will suit your requirements. Write for printed matter on this subject.

Borden & Selleck Co.

48 AND 50 LAKE STREET, CHICAGO.

TWO MILLS—PITTSBURGH, PA. AND MAUCH CHUNK, PA.

TO MAKE CLEAN, SMOOTH, BRIGHT CASTINGS, USE THE BEST FACINGS.

THE BEST FACINCS CAN BE HAD FROM McCORMICK, PITTSBURGH, PENNA.

J. S. McCORMICK Co. Incorporated, Pittsburgh, Pa.

FOUNDRY MOLDING MACHINES, STRIPPING PLATE MACHINES, PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1875.

STOW MANUF'G CO.,

BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

WRITE US FOR CATALOGUE AND PRICES

J. B. & J. M. CORNELL,

Manufacturers of POOLE'S PATENT

Pressure Blowers and Exhausters

GREATER VOLUME and HIGHER PRESSURE with LESS HORSE POWER than any other type.

A COMPARATIVE TEST between one of our Blowers (referred to as Blower "A") and one made by one of the best known makers in this country (referred to as Blower "B") was made by Prof. Denton, of Stevens Institute of Technology, Hoboken, N. J.

Prof. Denton says: "The general conclusions to be drawn from the experiments are: (1st) That for pressures varying from two to fourteen ozs. and quantities of air varying from 2,500 to 6,500 cubic feet per minute, Blower A delivered from 7 to 28 per cent. more air per horse power than Blower B. (2) That over the same range of pressures and volumes, Blower A utilizes in producing pressures from 6 to 60 per cent. more velocity of its blades than Blower B."

OFFICE AND WORKS—26th St. and 11th Ave., NEW YORK CITY.

WRITE FOR PRICES ——— **WORKS—Cold Spring-on-the-Hudson, N. Y.**

Putting Dollars in Your Jeans

No matter what kind of work you are doing, is accomplished with the help of *Smooth On.* Whenever you save a casting, and with this remedy you can save nearly all, there is something financial about it that tickles you and makes you feel like setting 'em up. Don't throw away a casting because it leaks or has a hole in it. Send for our booklet telling what *Smooth On* will do in such cases. It is a regular eye-opener to most foundrymen. Know how to control your scrap heap. This means proprietors, foremen and molders, too; it also means more profit and wages for everybody.

SMOOTH ON MFG. CO., Vreeland Tompkins, Mgr., 551 Communipaw Ave., JERSEY C TY, N.J.

DIXON'S

BLACK LEAD

CRUCIBLES

THE STANDARD THE WORLD OVER.

If you are not entirely suited with the crucible you are now using, possibly we can help you, as we make our crucibles according to the use for which they are intended.

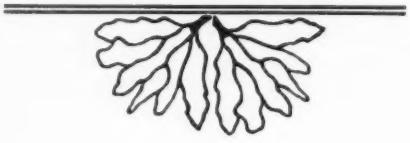
JOS. DIXON CRUCIBLE COMPANY,

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

537-39 West 27th St.,
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.

There are Two Kinds of
ROTARY PRESSURE
BLOWERS

THE ROOTS

AND OTHERS

OUR BLOWERS . . . . . .

represent all the "up-to-date" ideas and embody (what no other . . . . blower can) forty years of experience in the construction of this type of machine . . . . . .

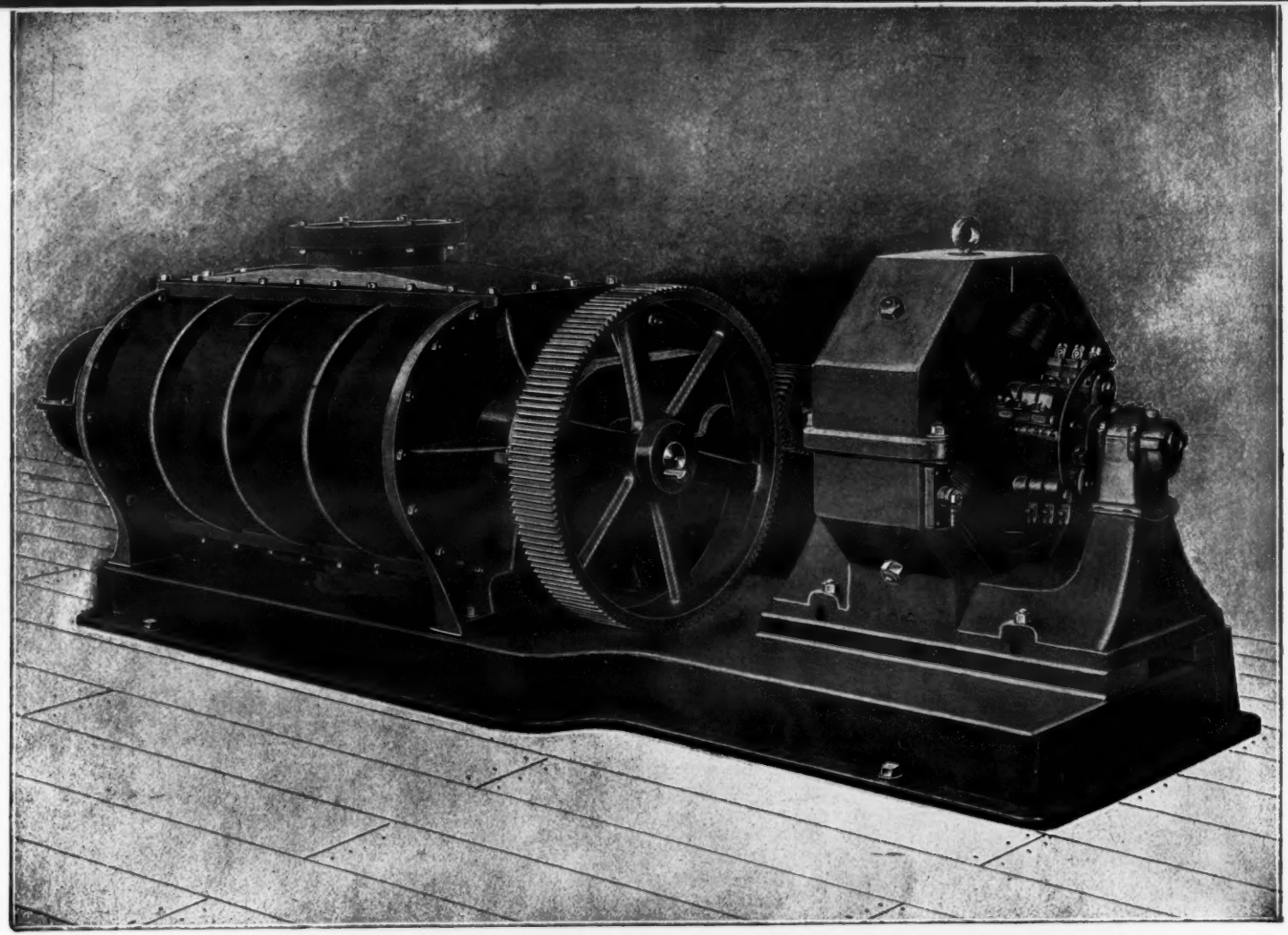
THE ROOTS obtains the *minimum of friction* and the *maximum of efficiency*. Others do not—cannot.

P. H. & F. M. ROOTS CO.,

109 LIBERTY ST., NEW YORK. CONNERSVILLE, IND.
VANDERGRIFT BLDG., PITTSBURG, PA.

AND AMERICAN GAS COMPANY,

222 South Third Street, PHILADELPHIA, PA.

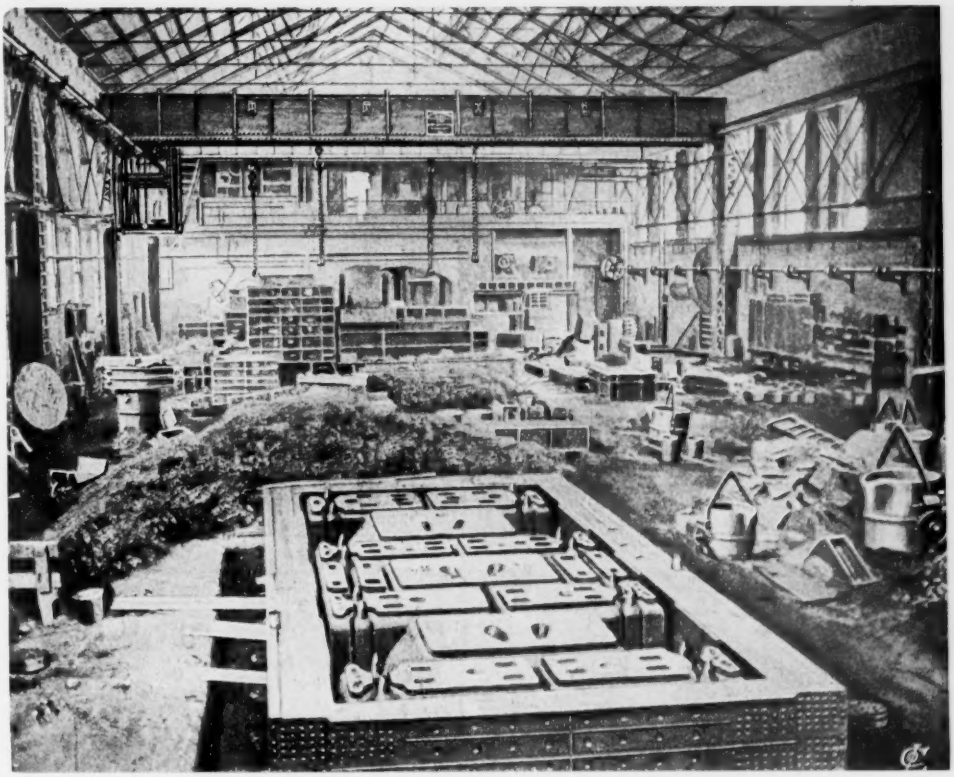


ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



We present herewith a view of our main foundry, which shows that the handling of large **Cores, Castings and Copes** is effected by **Two Traveling Cranes,** one of 30 tons capacity operated by power, the other of 26 tons capacity operated by three electric motors. These Cranes displaced two 50-ton Jib Cranes, two 25 ton Jib Cranes and four 10-ton Jib Cranes formerly required in the foundry.

It will be observed that the entire floor space is thus available. The delicate operation of lifting the cope of the green sand mold 21 feet long, shown in the foreground, and of setting the large and complicated cores, was quickly and safely performed by one Traveling Crane, operated by one man in the cage. The casting which was made in this mold weighed, after dressing, 61,000 pounds.

We constructed the first Traveling Cranes for use in our own shops in 1853.

We were the first to advocate and introduce **High Speed Traveling Cranes,** say with a bridge travel up to 200 feet per minute, trolley travel up to 100 feet per minute, hoisting speeds up to 40 feet per minute; all of which is quite practicable for all classes of work with our features of construction, and while crane users—foundrymen particularly—were skeptical of the practicability of high speeds for foundry service, such speeds, and even greater speeds, have come to be demanded by all classes of users.

We are prepared to meet all possible requirements as to capacity, speed, etc., etc., and any method of driving, and with the **assurance in each case of SAFETY and ECONOMY in working and with least cost for maintenance.** Correspondence on the subject is solicited.

ROOTS BLOWER GEARED DIRECT TO ELECTRIC MOTOR.

Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

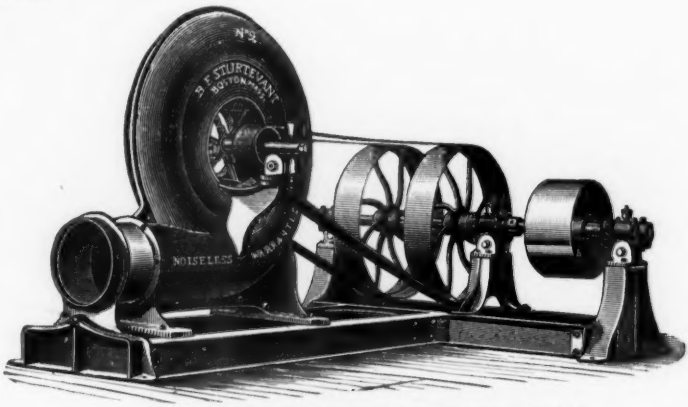
—FOR—

Cupoa Furnaces and Forge Fires.

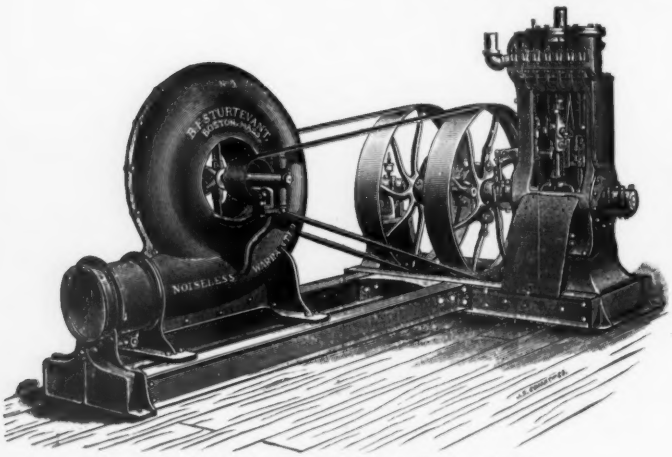
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

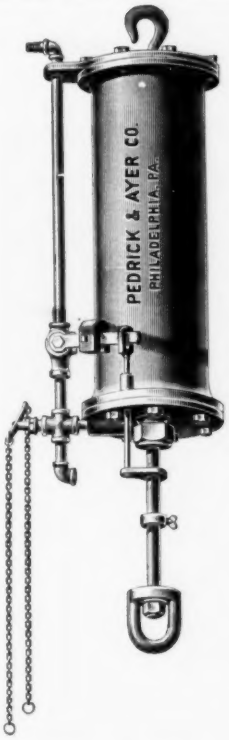
Send for Catalogue.

B. F. STURTEVANT CO.,

BOSTON, MASS.

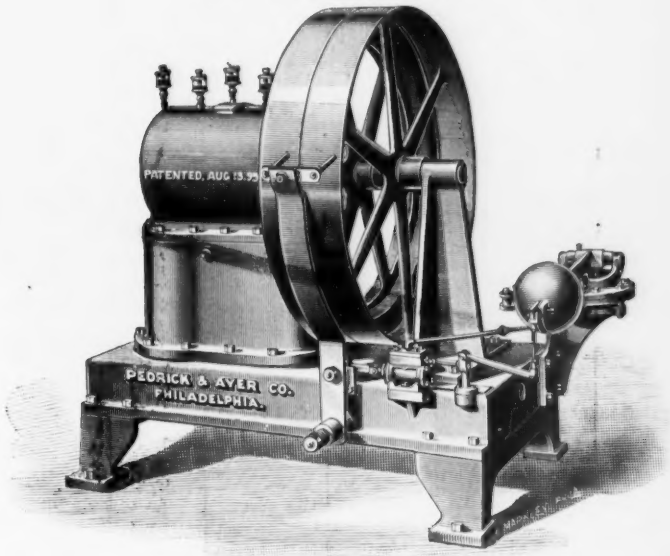
131 Liberty Street, NEW YORK. 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.



Automatic Compound Belt Air Compressors.

PATENTED AUGUST 13TH 1895.



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No.	Size of Cylinders in inches	Revolutions per Minute.	Cubic Feet of Free Air	Horse Power Required.	Size of Pulleys in inches	Shipping Weight of Compressor	Floor Space in inches	Telegraphic Symbol
1	11x 6 6x 6	100-160	32- 50	2-3½	40x5	2875 lbs.	60x40	Parian
2	15x10 8x10	90-120	90-120	9-15	60x6	5370 lbs.	76x60	Parish

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For ¼ inch, ¾ inch and 1 inch Hose.

These Compressors will compress more air at less cost than any other make, requiring no attention other than oiling; entirely automatic in action, stopping and starting as air is required. Specially adapted for foundry use. Can be run in series, if so, no stoppage possible.

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Straight Air Lift for foundry purposes when equipped with retaining and releasing valve, will hold the load whether heavy or light, in the desired position, as in case of lifting a ladle of molten iron and pouring it or raising a flask to knock out the sand. It can neither ascend or decend as long as connected to air supply.

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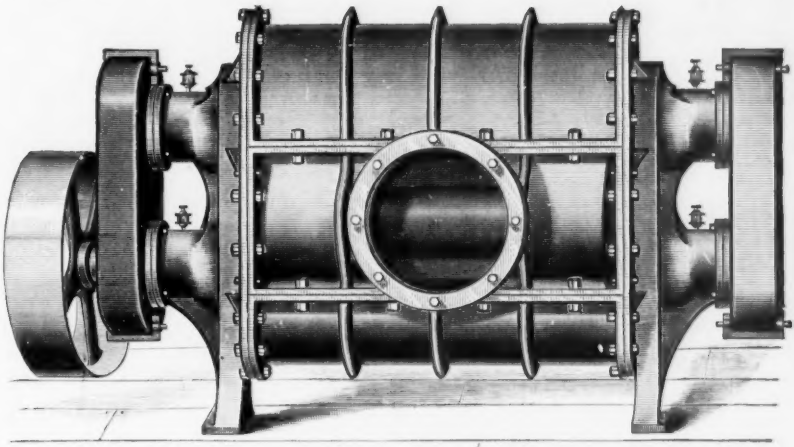

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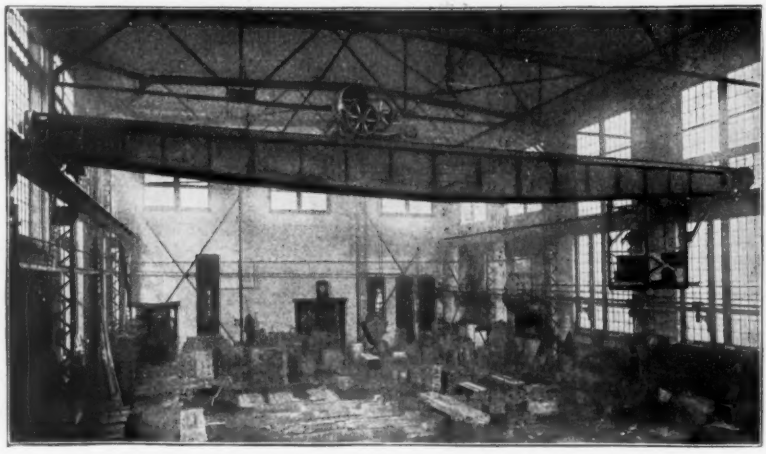

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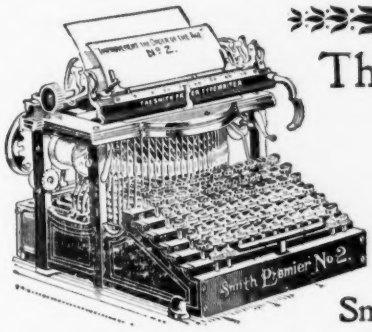

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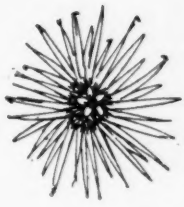

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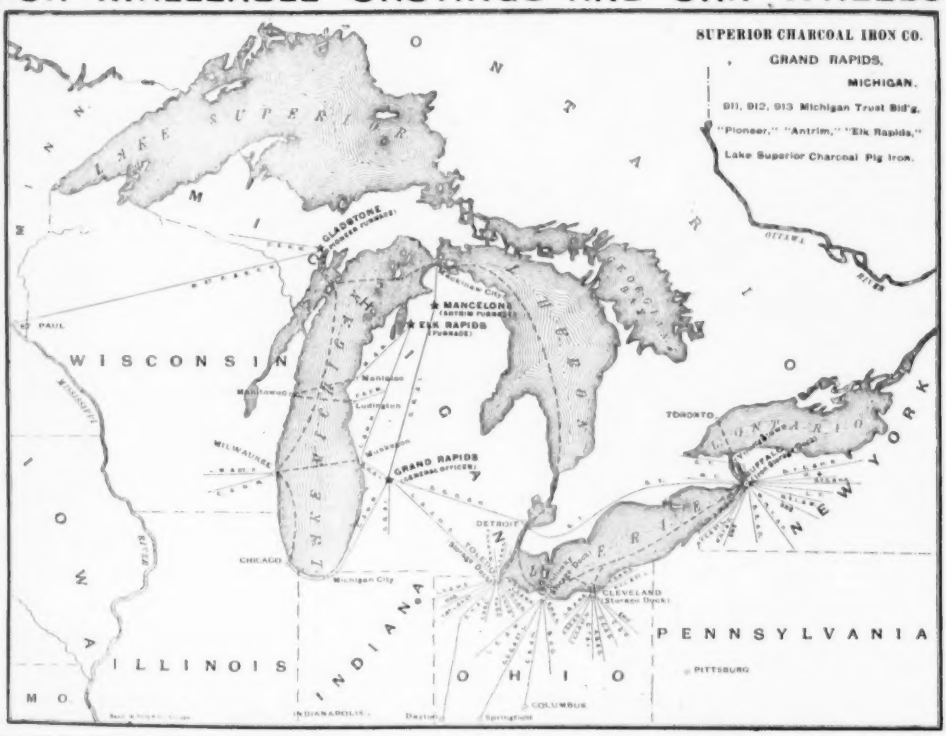

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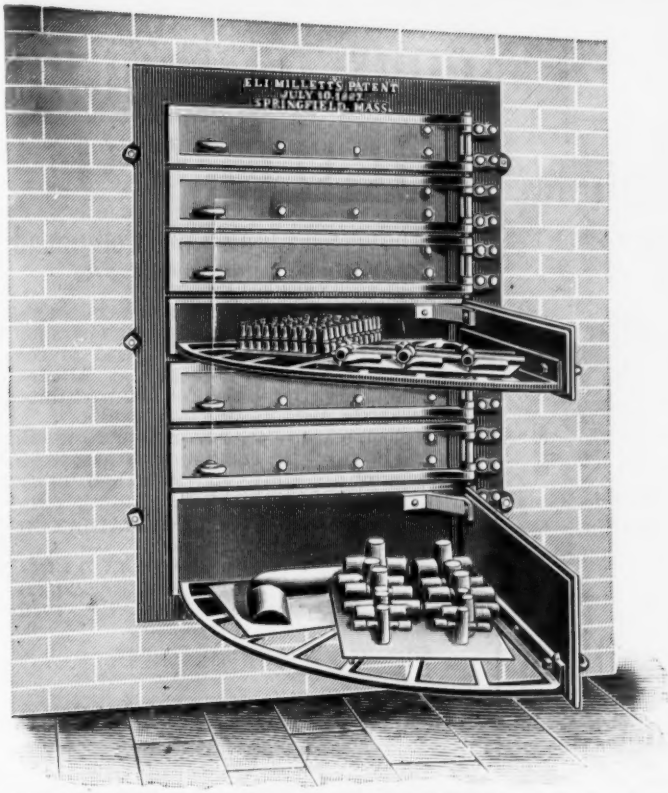

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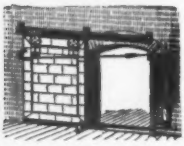

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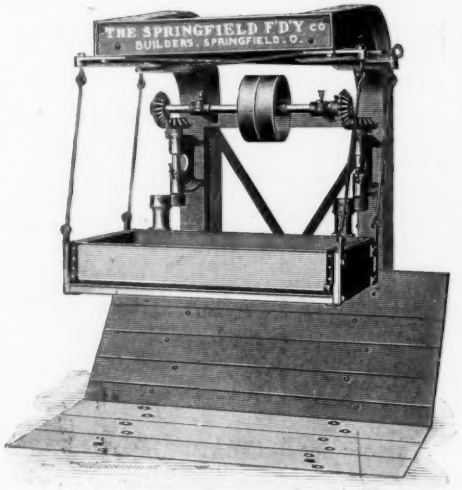

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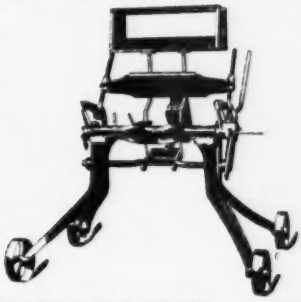
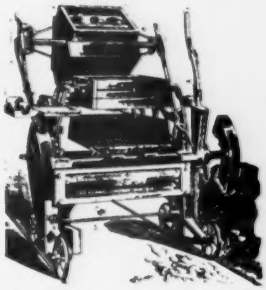

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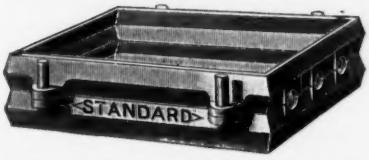

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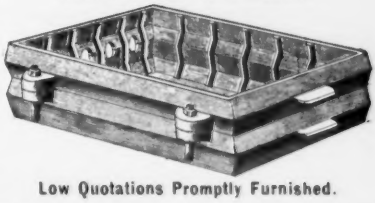

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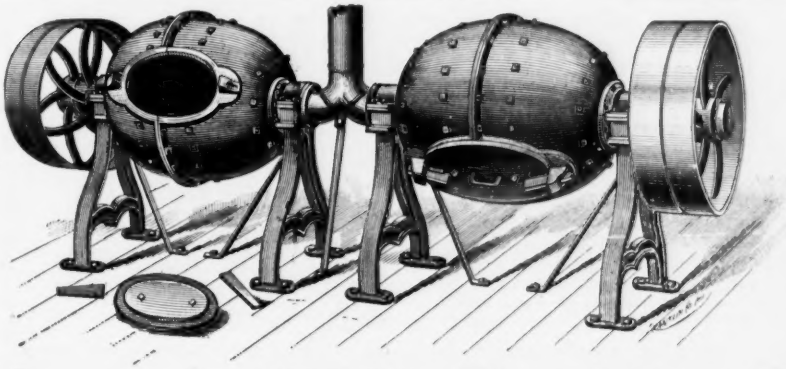

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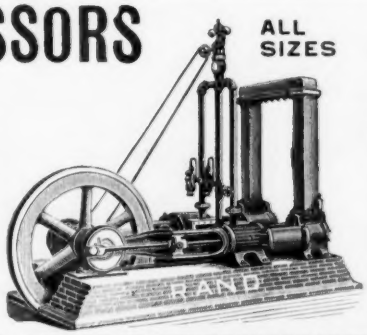

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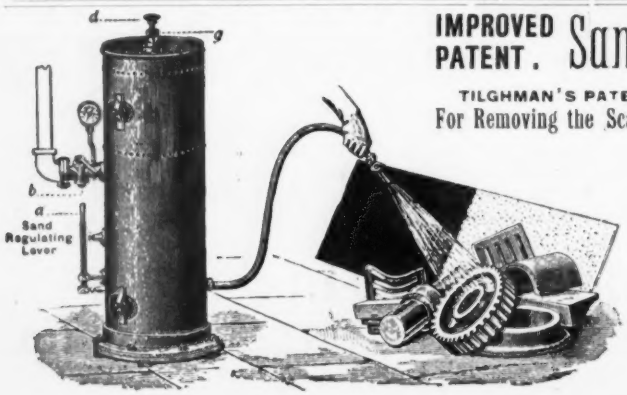

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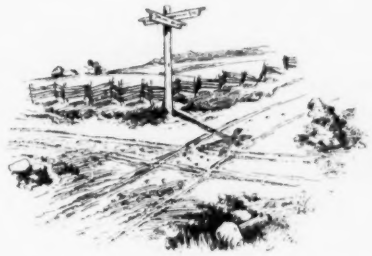

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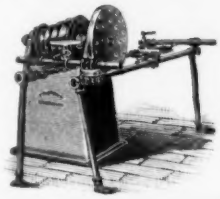
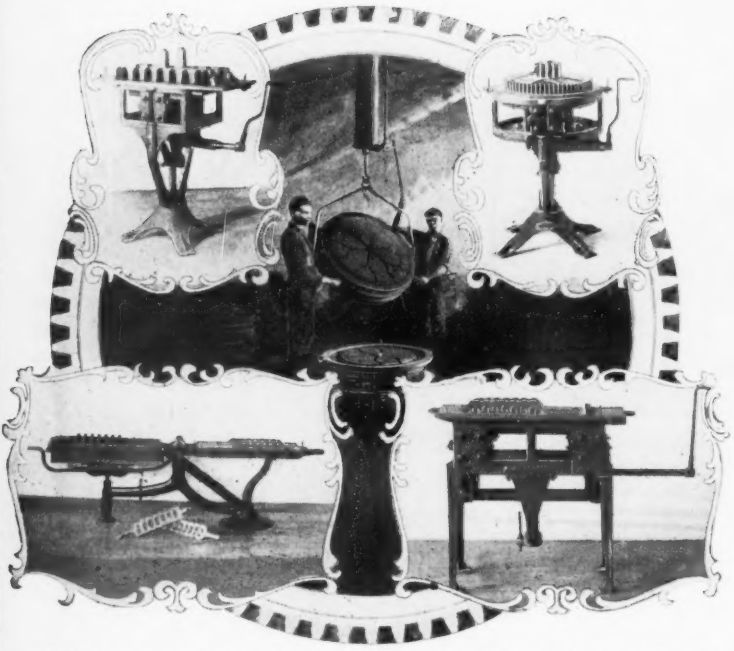
A Pattern Pattern Maker



needs good tools, especially lathes, and there might be something in the fact that FAY & SCOTT have made Pattern Makers' Lathes for years and that these lathes are found the world over installed in the best shops. Lathes from 10 to 84 inch swing. Better write to-day and then you won't forget.

Fay & Scott, Dexter, Maine, U. S. A.



Rights to use these machines for molding malleable iron or steel castings are reserved.

YOU CAN HAVE A

"Pridmore"

MOLDING MACHINE

Built to your order, and built to meet your special requirements, for the same price that you can buy a machine of the "ready-made" type, that fits everything and fits nothing.

As long as you intend to meet competition hadn't you better get a "Pridmore?" Guaranteed all the way through. Tell us what kind of work you are doing and we will say just what we can do for you.

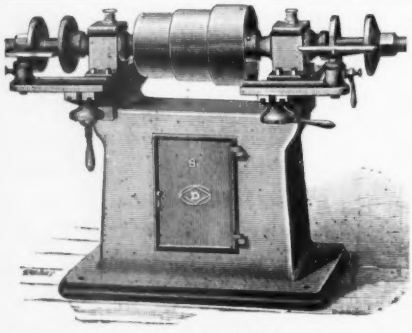
HENRY E. PRIDMORE, 111-113 W. HARRISON ST., CHICAGO

BE WISE

THE GOBEILLE PATTERN COMPANY

(PROMPT AND RELIABLE)

CLEVELAND, OHIO



No. 8 GRINDER.

If you want a

Big, Heavy Grinder

For foundry work, here it is. We also have smaller and larger sizes. Our catalogue No. 19 tells all about them.

DIAMOND MACHINE CO. Providence, R. I.

E. A. FORD,

GEN. PASS. AND TICKET AGENT, PITTSBURG, PA.

ALL STYLES **CRANES** ANY CAPACITY

THE **CASE** MANUFACTURING CO.,

COLUMBUS, OHIO.

Substantial and Reliable

Two good old words in business phraseology; and they're all right, but not entirely satisfying. Do we not agree that we all succumb to the fascinations of EMBELLISHMENT? Why, even the miser loves the very LETTERS on the glittering coins.

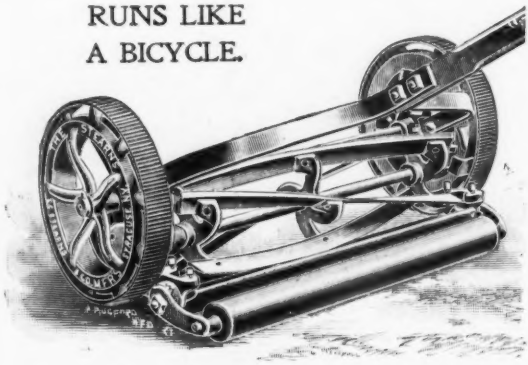
Shall we tell you how to "hit two birds with one stone?" Satisfy the public taste as well as curiosity by displaying on your castings your firm name. We can furnish you just the Pattern Letters to show it up in GREAT SHAPE.

ÊÊÊÊÊ
ECEN

H. W. KNIGHT & SON, Drawer 1156. **Seneca Falls, N. Y.**

Stearns Ball-Bearing Mower.

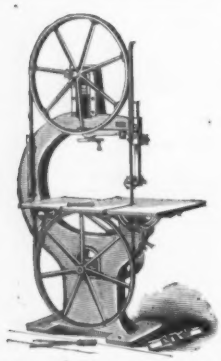
RUNS LIKE
A BICYCLE.



The bearings are micrometer-gauged balls, revolving between accurately adjusted hardened ground steel cones and cups.

For sale by Hardware Dealers generally. Descriptive circular and prices on application.

E. C. STEARNS & CO., SYRACUSE, N. Y.



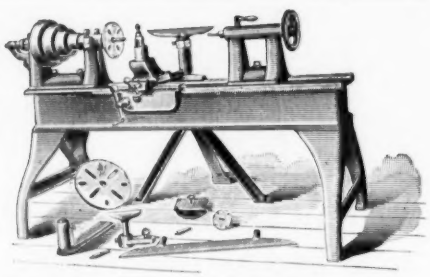
... Complete Outfits ...

FOR

Pattern Shops

STRICTLY FIRST-CLASS TOOLS.

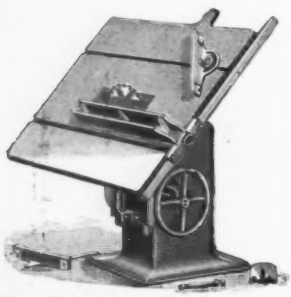
MANUFACTURED BY



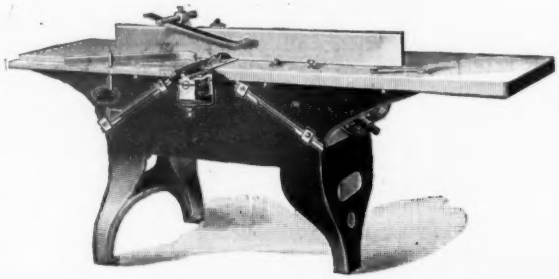
Pattern Makers' Lathes. Iron Bed with or without Carriage.

4 in. and 36-in. Band Saw Machine.

THE FRANK H. CLEMENT CO. 336 LYELL AVENUE, ROCHESTER, N. Y.



No. 1 Variety Saw Bench. All iron and steel.



THE J. S. McCORMICK CO.

PITTSBURG, PA.

MANUFACTURERS OF THE MOST COMPLETE LINE OF FOUNDRY FACINGS IN AMERICA . . . . . .

FOUNDRY MOLDING MACHINES,
STRIPPING PLATE MACHINES,
PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1875.

STOW MANUF'G CO.,

BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

WRITE US FOR CATALOGUE AND PRICES

Business is Business

It takes money to pay for advertising.

An article can not be advertised and kept before the public unless it possesses merit.

When we tell you that **Smooth On** has been advertised regularly in THE FOUNDRY for nearly three years, you will understand that its qualities are of the lasting kind.

Foundrymen are a very conservative class, but when they do find a good thing, how they do stick to it.

And why should they not stick to **Smooth On** when **Smooth On** sticks to their defective castings so that even a sledge hammer fails to separate it.

Lots of cheap so-called iron-fillers on the market, that will stay in a casting about as long as putty and then give you away the minute some one gives the casting a rap.

Smooth On is the only perfect preparation for curing defects in castings, whether they are blow or sand holes, or leaks caused by dirty iron.

The chemical reaction which takes place after its application, renders it a part of the casting itself and the "doctored" portion may be finished the same as any other part of the casting.

Write for a Sample Can of **Smooth On** to-day and see what it will do. You will kick yourself for not having done this sooner.

SMOOTH ON MFG. CO., Vreeland Tompkins, MANAGER. 551 Communipaw Ave., JERSEY CITY, N. J.

BUY THE ORIGINAL AND BEST

Our FACINGS and BLACKINGS are known the world over as the *standard*. Every foreman knows them, every molder has used them.

EAST INDIA PLUMBAGO
SILVER LEAD
GRAPHITE
} All Kinds and Qualities for every known purpose.

PURE WHITE
BLUE
YELLOW
CREAM
ORANGE
TALC

SELLING AGENTS WHITING CUPOLAS, CRANES, LADLES, ETC.

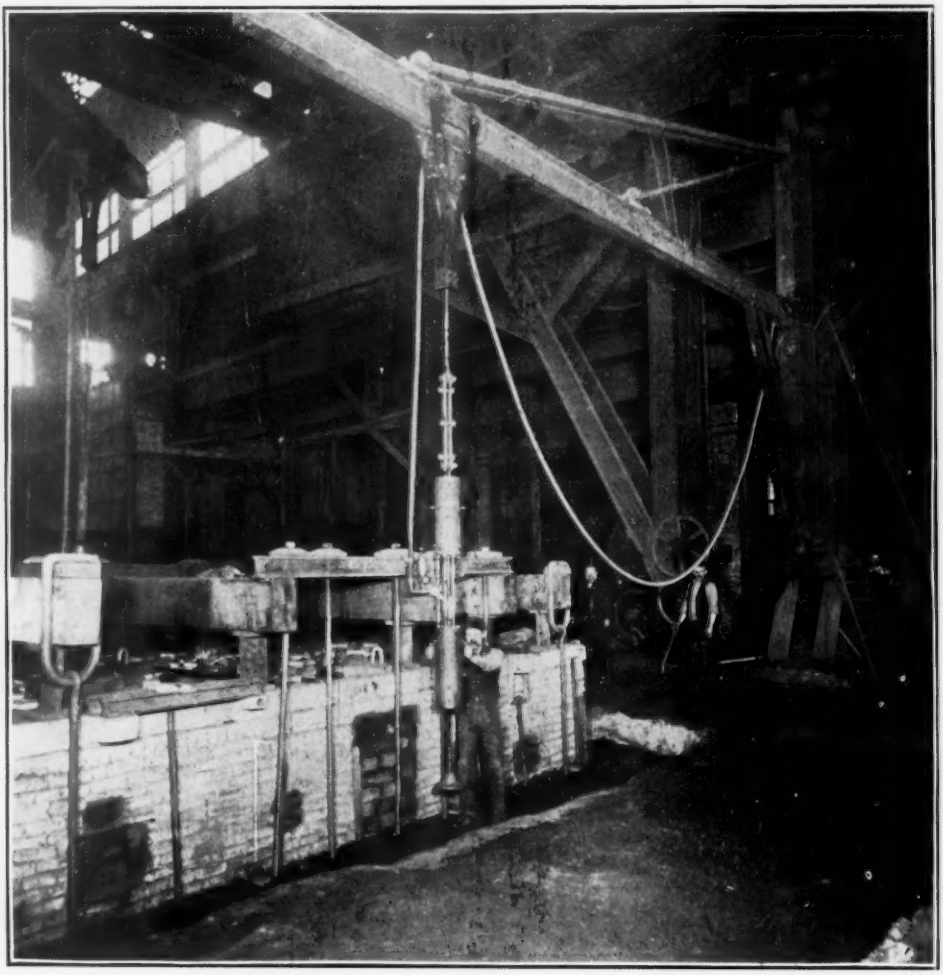
THE S. OBERMAYER CO

CINCINNATI, O. CHICAGO, ILL.

THE LARGEST AND MOST RELIABLE FOUNDRY SUPPLY HOUSE IN THE WORLD.

Have you Catalogue No. 26? If not, write for same and mention "THE FOUNDRY."

Cramp Pneumatic Rammer



Invented to save labor in ramming up a mold.

Swung upon a light crane attached to the side of the building or from a post.

A trolley gives it two motions, in-and-out and circular, covering every inch of surface in a radius of 25 or 30 feet.

Can be run by air or steam, compressed air preferable. With a pressure of about forty pounds it strikes 250 times a minute or as desired.

One man handles it with ease and does the work of a dozen by hand ramming.

The sand or dirt is packed with an even pressure.

The mold is secured beyond a doubt and saves metal by uniform ramming.

The mold is rammed up in one-third the time.

No well equipped Foundry can afford to be without this machine.

For further particulars, apply to

J. W. Paxson Co.

1021 North Delaware Avenue,
PHILADELPHIA, PA., U. S. A.

A NEW IDEA! Foundrymen! Control the Gear Owners' Portable Gear Molding Machine

A NEW IDEA! Foundrymen! Control the Gear Business in Your Own Locality!

The day of costly patterns, destructive rapping, and teeth-with-draft is passing; the machine molded gear, made without pattern, and with draftless teeth is here to stay. Why let outsiders ship fine machine molded gears to your next door neighbor, and catch other work?

UNIVERSAL GEAR MOLDING MACHINE. (GROVES' PATENT)

The machine illustrated above is described as Universal, because it is perfectly adapted for the molding of Spur, Bevel, Helical Staggered or Worm Toothed Gearing (internal or external) from 6 inches to 72 inches diameter, and to 15 inches face; and this variety of work is done without any change of parts, except tooth block,

Groves' Portable Gear Molding Machine

No Jobbing Foundry can afford to be without it. Others use it, why not you?

This simple, economical and inexpensive appliance is adapted for molding the teeth of large gears from 32 inches up to 24 feet in diameter and any face; also rims of Belt and Rope-Driving Pulleys, Band and Fly Wheels, etc., doing away with large, expensive full patters and can be removed from the foundry floor in a few minutes after the mold is formed, thus leaving valuable space ready for other work.

Apply for Price, etc., to the . . Exclusive Agents . . . . . J. W. PAXSON CO. 1021 N. Delaware Avenue, PHILADELPHIA, PA.

Good Things to Know

PLUMBAGO CRUCIBLES were first make by Joseph Dixon in 1827.

All Plumbago Crucibles now made either in America or Europe are . . . made substantially after his idea.

The chemistry of a Crucible, which concerns the mixtures, and its mechanics, which concerns putting the ingredients together, are equally important.

To make good crucibles, therefore, the manufacturers must needs be both chemists and mechanics.

The **Dixon Plumbago Crucibles,** of all sizes and for all uses, are made on good chemical and mechanical lines and hence, after a period of 71 years since first made by **Joseph Dixon,** they are considered as standard all the world over.

There are very few business firms that can point to a consecutive existence of 71 years—nearly three-fourths of a century.

To live that long and be at the top at the end of 71 years, means the DIXON COMPANY make good wares and keep up with the times.

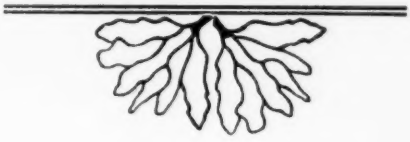
Send your address for a pamphlet entitled: "Crucible Making and How to Use Them."

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

537=39 West 27th St.,
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
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WATERFORD, N. Y.
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We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO, ILL.

P. C. COCHRAN, PRESIDENT.
J. H. WURTZ, SECRETARY.

J. R. LAUGHREY, TREASURER.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. 3500 Tons Daily Capacity.

300 30-TON GONDOLA CARS — 50 30-TON COKE CARS.

Shipments of Coal commenced November 23 1893.
" Coke " August 29, 1894.

Coal shipped during	1893	3,750 Tons.
Coal and Coke shipped during	1894	204,500 "
" " "	1895	370,000 "
" " "	1896	353,000 "
" " "	1897	750,000 "

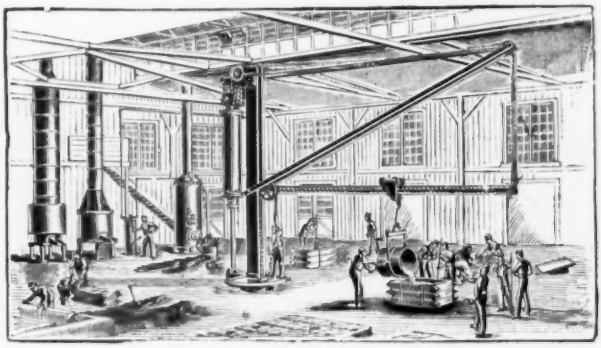
GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

"Say, Will She Work With Air?"

Why, to be sure she will.

Lots of Ridgway Cranes are operated by compressed air and steam, both. Two pipes are used, one to the boiler and one to the air compressor. They use either air or steam as they please, by the simple turning of a valve. Steam is the cheapeat, of course, and as no concern ever puts in an air compressor but it is soon overtaxed by the dozens of new uses for the air, the Ridgway Crane is soon worked with steam entirely to save the air and relieve the compressor. Besides it works so nice with steam and at less cost, and when the compressor breaks down, the crane don't have to stop. Only a boiler explosion will stop the crane.

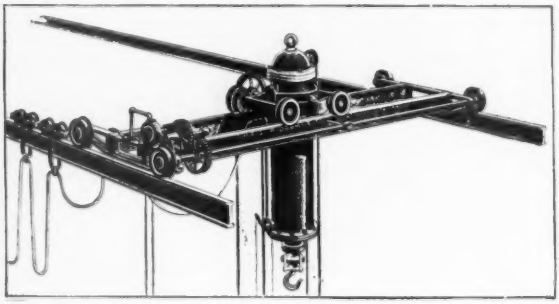


5-Ton Steam Hydraulic Crane in a Foundry.

Ridgway Crane can be worked by city water pressure, too. Can be worked by a little hand pump any time a hand-power crane is required. "Oh, it's a dandy," this Ridgway Crane. No man who has to put in a crane should think for a minute of buying a crane until he has investigated it a little. It don't cost anything to find out about it. We don't follow up inquiries with a visit unless we are asked. Make your own investigation. You'll get Ridgway Cranes quick enough when you know it. It's a great money saver, as you will soon find out.

Air Hoists. For Example:—

One of the trade papers illustrates and describes "The Model Stove Foundry" of Walker & Pratt Mfg. Co., Watertown, Mass. Listen what is said of Ridgway Air Hoists:



* * * "The company are particularly well pleased with their trolley system and overhead cranes, the latter being equipped with the Ridgway Oil Governed Air Hoists, made by Craig Ridgway & Son, Coatesville, Pa. There are 15 of these air hoists in the building, and the complete control which they give over the heavy castings and other articles to be moved is a notable factor in the efficiency of the men and the rapidity with which the work can be handled.

"The Oil Governed Air Hoists can be operated at any speed from hardly perceptible motion to the rapidity almost of a free falling body, and perfect control is given by a chain which instantly stops the hoist in any position." * * *

NOTE.—"*The company are well pleased.*" That's why we want you to try *Just One.*

"PLEASE TAKE THE ELEVATOR."

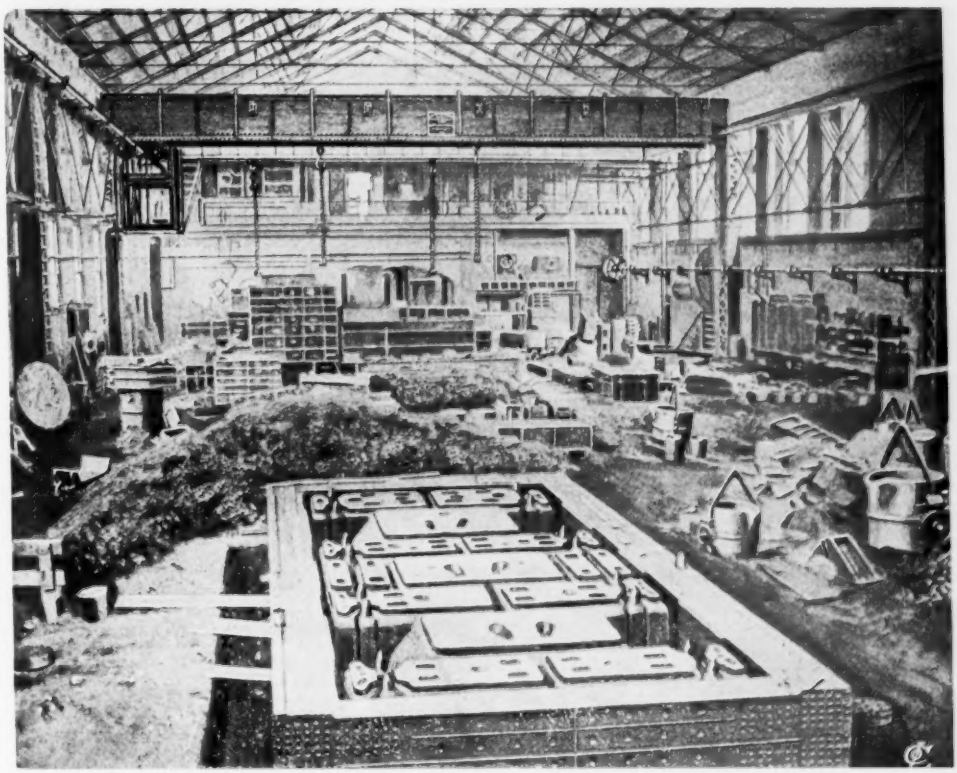
An hydraulic elevator that goes by steam.
For cupolas and the like.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



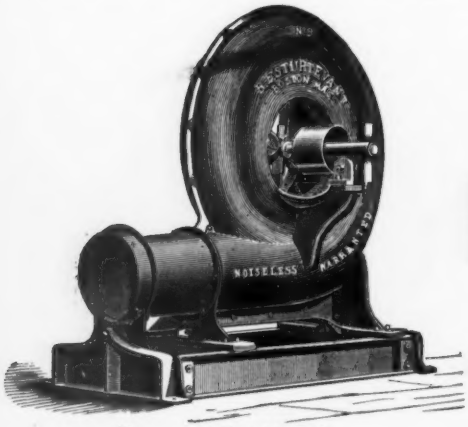
We present herewith a view of our main foundry, which shows that the handling of large **Cores, Castings and Copes** is effected by **Two Traveling Cranes,** one of 30 tons capacity operated by power, the other of 26 tons capacity operated by three electric motors. These Cranes displaced two 50-ton Jib Cranes, two 25 ton Jib Cranes and four 10 ton Jib Cranes formerly required in the foundry.

It will be observed that the entire floor space is thus available. The delicate operation of lifting the cope of the green sand mold 21 feet long, shown in the foreground, and of setting the large and complicated cores, was quickly and safely performed by one Traveling Crane, operated by one man in the cage. The casting which was made in this mold weighed, after dressing, 61,000 pounds.

We constructed the first Traveling Cranes for use in our own shops in 1853.

We were the first to advocate and introduce **High Speed Traveling Cranes,** say with a bridge travel up to 200 feet per minute, trolley travel up to 100 feet per minute, hoisting speeds up to 40 feet per minute; all of which is quite practicable for all classes of work with our features of construction, and while crane users—foundrymen particularly—were skeptical of the practicability of high speeds for foundry service, such speeds, and even greater speeds, have come to be demanded by all classes of users.

We are prepared to meet all possible requirements as to capacity, speed, etc., etc., and any method of driving, and with the **assurance in each case of SAFETY and ECONOMY in working and with least cost for maintenance.** Correspondence on the subject is solicited.



Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

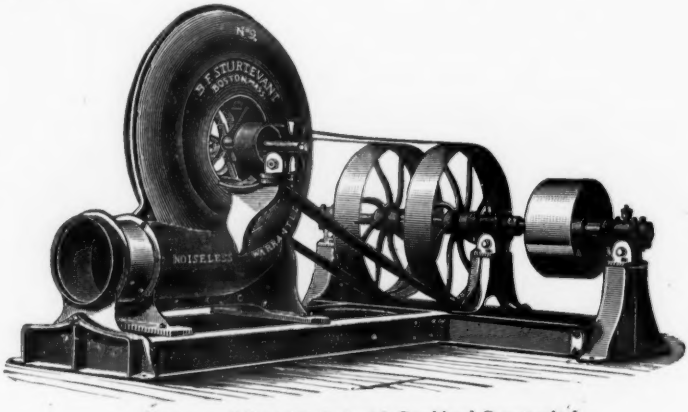
—FOR—

Cupola Furnaces and Forge Fires.

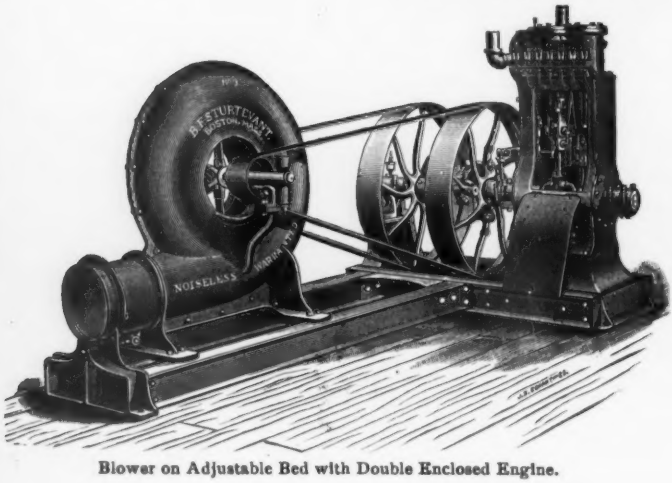
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

B. F. STURTEVANT CO.,

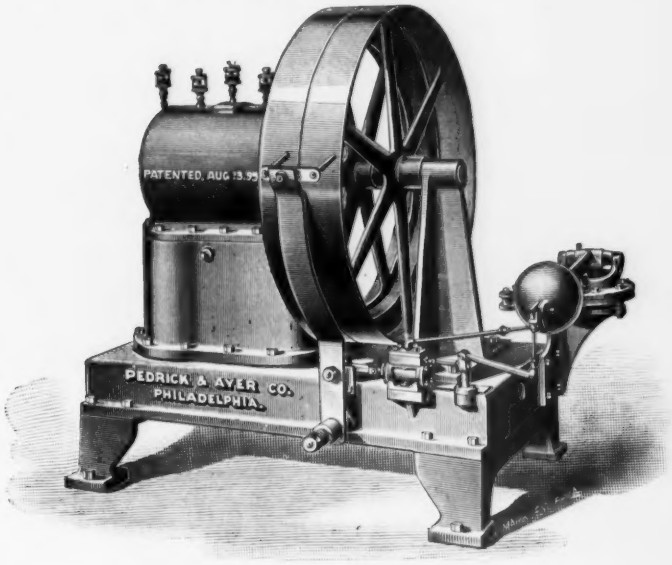
BOSTON, MASS.

131 Liberty Street, NEW YORK, 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.

Automatic Compound Belt Air Compressors.

PATENTED AUGUST 13TH 1895.



Straight Lift Hoist. **Built in two sizes, Nos. 1 and 2.**

No.	Size of Cylinders in inches	Revolutions per Minute.	Cubic Feet of Free Air	Horse Power Required.	Size of Pulleys in inches	Shipping Weight of Compressor	Floor Space in inches	Telegraphic Symbol
1	11x 6 6x 6	100-160	32- 50	2-3½	40x5	2875 lbs.	60x40	Parian
2	15x10 8x10	90-120	90-120	9-15	60x6	5370 lbs.	76x60	Parish

HORIZONTAL HOIST.

PAT. SEPT. 4TH 1894.

AIR HOSE COUPLING

For ½ inch, ¾ inch and 1 inch Hose.

These Compressors will compress more air at less cost than any other make, requiring no attention other than oiling; entirely automatic in action, stopping and starting as air is required. Specially adapted for foundry use. Can be run in series, if so, no stoppage impossible.

Horizontal Air Lift for low ceilings; for general lifting, quick in action and under perfect control of operator.

Straight Air Lift for foundry purposes when equipped with retaining and releasing valve, will hold the load whether heavy or light, in the desired position, as in case of lifting a ladle of molten iron and pouring it or raising a flask to knock out the sand. It can neither ascend or decend as long as connected to air supply.

Air Hose Couplings are designed to do away with long lines of hose. By having suspended along the air line a number of hose equipped with this device, connections can instantly be made or disconnected, allowing one hoist to serve in several places. Each size made in duplicate. Containing a shut-off valve.

Send for circulars and details to Pedrick & Ayer Co., Pneumatic Department.

PEDRICK & AYER CO.

SPRING GARDEN STATION, PHILADELPHIA, PA.

Manning, Maxwell & Moore, *Sole Agents,* 111-113 Liberty St., New York City. 60 South Canal St., CHICAGO, ILL. 424 Telephone Bldg., PITTSBURG.

Crucible.

ROBT. J. TAYLOR & SON

COR. 19th & CALLOWHILL ST. PHILA. TRADE MARK.

Crucible

Dipper.

Cover.

Stopper.

Crucibles

For melting Steel, Brass, Copper, Gold, Silver, Nickel and Metals and Alloys of Every Description; SmallCrucibles for making Assays and fine pure Plumbago for lubricating, etc.

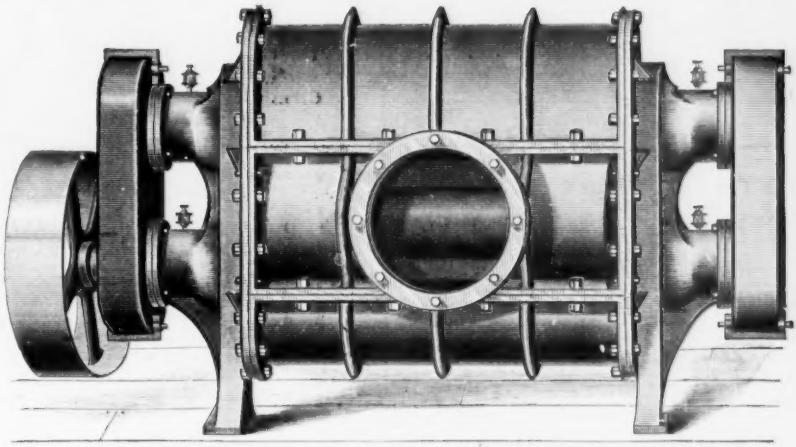
We are practical workmen and have studied the requirements of the different metal works in this country, as well as in Europe. We also work strictly by chemical analysis, giving a uniformity at all times never before approached in this or any other country.

We make All Sizes, from 8 oz. to 2 ton Capacity.

ROBT. J. TAYLOR & SON,

1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, detachable journal bearings, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co

2518 Frankford Ave. PHILADELPHIA, PA.

Sales Agents: **Frazer & Chalmers, Inc.** CHICAGO, ILL., and BRANCH HOUSES

DIRECTORY OF LEADING PIG IRON DEALERS.

MATTHEW ADDY & CO.
CINCINNATI, ST. LOUIS.
Agencies,
Chicago, Detroit, New York,
Philadelphia. Pittsburg.

DAYTON COAL & IRON CO.
(Limited)
PIG IRON.
Dayton, Tenn. Cincinnati, Ohio:

THE DOMHOFF & JOYCE CO.
PIG IRON-COKE.
CINCINNATI.

F. A. GOODRICH & CO.
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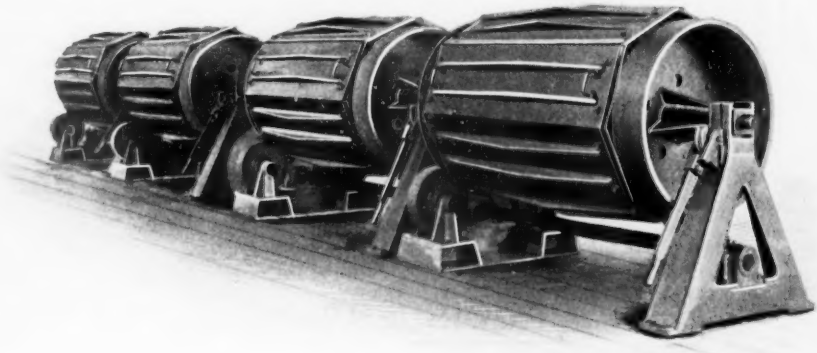

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AS MANUFACTURED EXCLUSIVELY BY THIS COMPANY.

THESE tumblers were furnished for a well known malleable foundry and an additional order for twice the number has since been placed with us. You should investigate the merits of these and our other types of tumblers. Try the WHITING CAR WHEEL CLEANING MACHINE and save money.

TRAVELING AND JIB CRANES HAND OR POWER . .
FOR ANY SERVICE.

THE WHITING CUPOLA.
THE AVERY MOLDING MACHINE.

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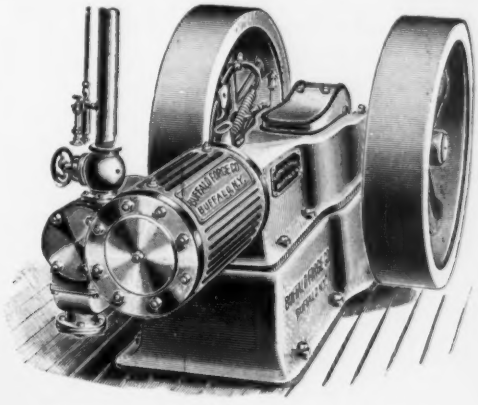
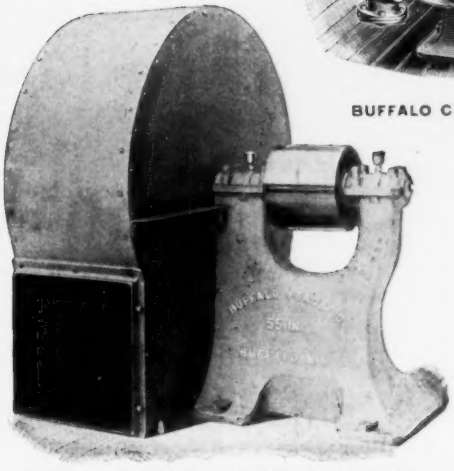


BUFFALO CLASS "A" AUTOMATIC ENGINE.



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Tumbling Barrel Exhausters are easily applied, thoroughly efficient, and change casting cleaning rooms from a death-dealing pestilence to a comfortable working apartment.

Send for details.

Our 400 Page Calalogues tell all about these machines, applications, etc.; also Fan System of Heating Foundries, etc.

BUFFALO CUPOLA BLOWER.

Buffalo Forge Company,

BUFFALO, N. Y.

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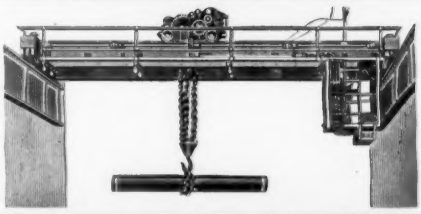

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THE CASE MFG CO

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A MOLDER'S DUTY!

THE Molder who not only puts up his regular day's work, but takes interest enough in his employer's welfare to notice when he can save the firm a little that might be wasted, is the one who in the end is sure to gain by it. If you have some little improvement that will save time or expense, explain it to your foreman and do what you can to make the shop turn out good work so they can compete with other shops. Thousands of brass molders have decided that the best charcoal facing or parting ever used is manufactured by Springfield Facing Co. If you do not find it in your shop, it is your duty to tell your boss about it. Tell him we will send a sample barrel and if not entirely satisfactory they need not pay for it. Our Stove Plate Charcoal also leads the market. : : : : : : :

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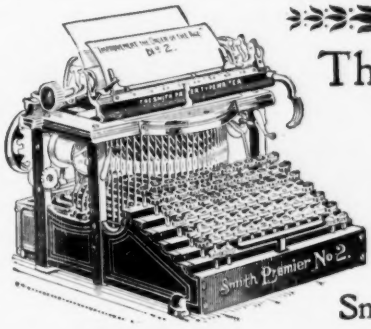

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EASILY OPERATED,
MECHANICALLY SUPERIOR
WRITING MACHINE.

Send for New Art Catalogue.

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handle anything as a side line, it is liable to be neglected and attended to only when there is nothing else to claim attention.

This is as much true of molding sand as anything else. Carelessness in selection and mining will cause the foundryman untold annoyance later on.

We put our whole time into the mining and shipping of molding sand. We are specialists in our line and you know the specialist is the man who gives satisfaction both in price and quality.

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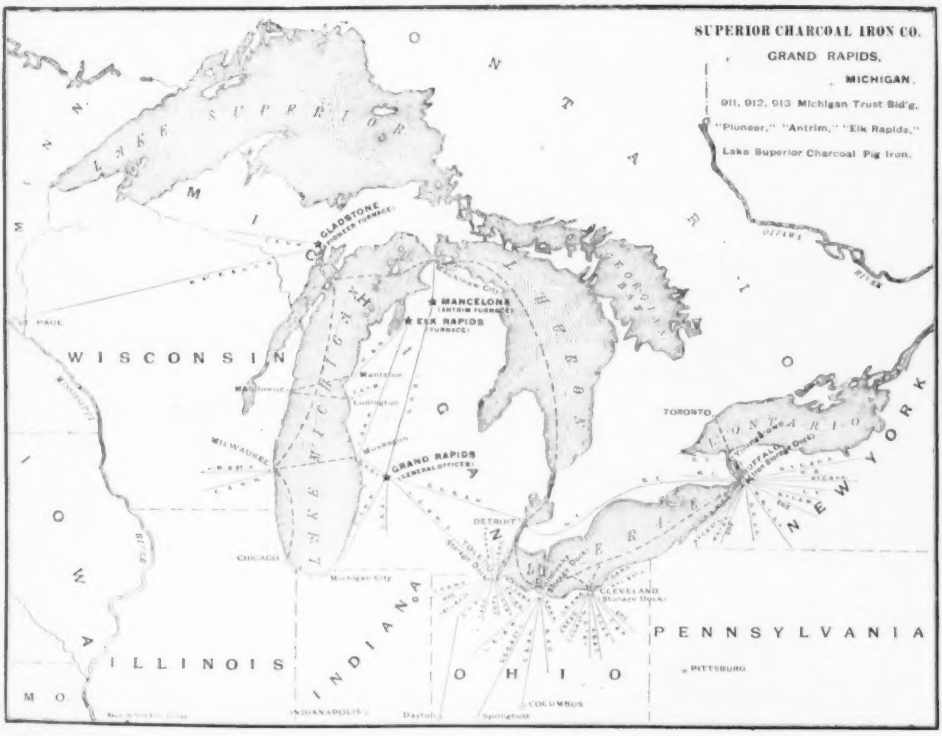
FOR MALLEABLE CASTINGS AND CAR WHEELS.



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PLUMBAGO CRUCIBLES

FOR MEN THAT

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using them and then they cannot be surpassed in durability; 90 heats have been attained from one crucible. Send for testimonials, quantity and sizes wanted, and we will quote you figures.

Ceylon Plumbago

PURE and HEAVY, is the only material for FACINGS if you want a bright smooth casting or for a Lubricant or Stove Polish, etc.

We keep it for sale.

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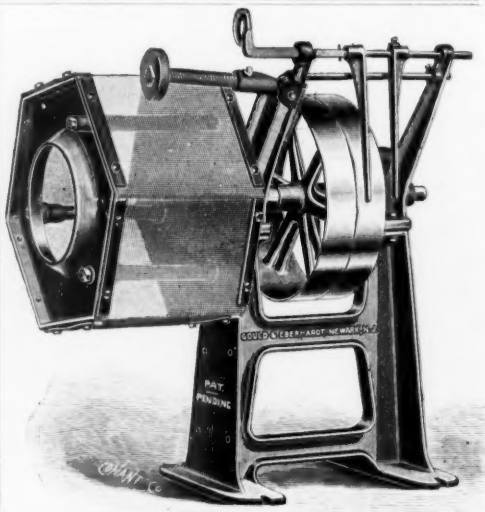

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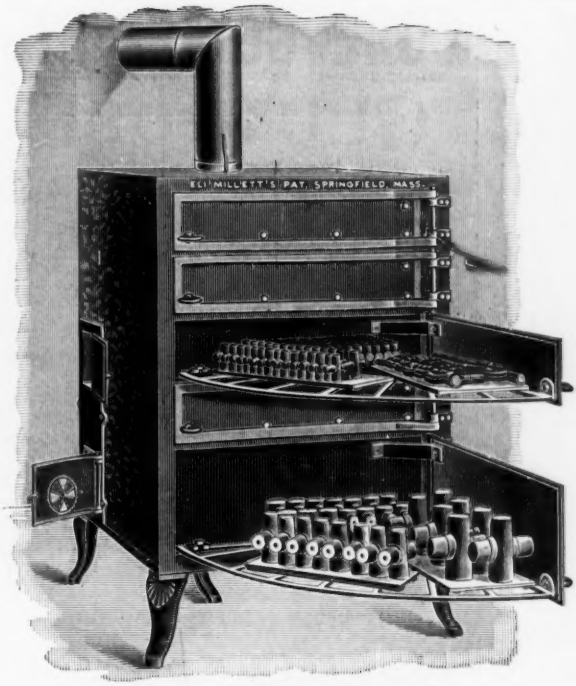
GENTLEMEN—As to the working of the Sand Sifter, it is *more than satisfactory*. After using a shaker, which not only shook the sand, but also shook itself apart periodically, it is a great relief, doing its work *quietly* and *thoroughly*, and we shall be pleased to recommend it to anyone you may refer to us. Yours truly,

BELL & FYFE FOUNDRY CO.

Per J. M. Lowe V. Pres.

GOULD & EBERHARDT, NEWARK, N. J.



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Double Doors,
One closing the oven when the other is open.

THE BEST IN THE WORLD.

No Foundry using small Cores can afford to be without it.

Over two hundred in use.

Send for our new Catalogue giving names of those using them.

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For Sale by THE J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Chicago, Ill.

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"FAIR DEALING" Their Motto.

MANUFACTURERS OF

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INSPECTED FOUNDRY IRONS . . . . .

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In New York and New England.

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Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

ESTABLISHED 1854.

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CUPOLA LOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

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PARLOR DOOR HANGERS.

The adjustment is in the Track and not in the Hanger, as are others.

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BARN DOOR HANGERS.

Impossible for door to jump the track. Very simple and cheap to apply.

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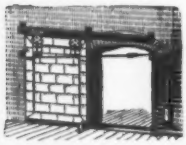

FIRE DOOR HANGERS.

Recommended and adopted by fire underwriters all over the United States.

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The Coburn Patent Trolley Track

Overhead Tramway

Furnished complete with straight and curved track, switches, frog brackets, single and double carriers.

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The Coburn Patent Trolley Track

—AND—

Patent Rolling Ladder Systems

Over 10,000 in use in the U. S. Roll suspended from ceiling or facing the shelves.

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The Coburn Trolley Track Mfg. Co.,

HOLYOKE, MASS.

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GLUTROSE

(Trade Mark.)

The Universal Liquid Core Compound

Patented in the United States, England, France and Belgium.

GLUTROSE was invented and is manufactured by a practical foundryman of many years' experience, It has been used in the Pennsylvania Railroad Foundry at Altoona and other large foundries for the past three years with the most satisfactory results.

It is cheaper and better than flour, rosin, oil, molasses or any other compound in use; takes the place of all other materials and never varies in quality.

WILL MAKE FIRST-CLASS RADIATOR CORES WITHOUT RODDING.

WHY PAY 30 to 40 CENTS FOR LINSEED OIL WHEN THE SAME RESULTS CAN BE OBTAINED FOR HALF THE MONEY?

WILL NEVER BLOW THE CASTINGS.

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Sole Manufacturers.

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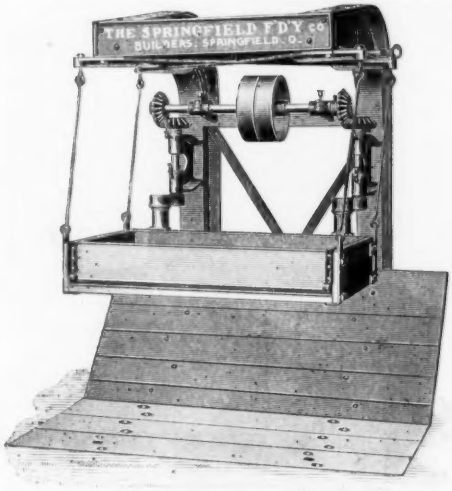
No. 925 Chestnut St., Philadelphia.



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Sand Riddling Machines

BOTH HAND AND BELT POWER.

These are the Best, Simplest, Most Durable and Most Easily Operated Sand Riddling Machines made. For full particulars and references, address,

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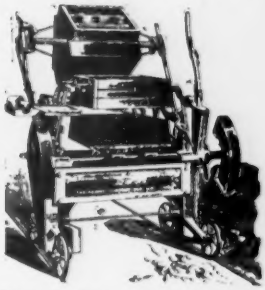
FARWELL'S **MOLDING MACHINES** Send for Catalogue



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Manufacturers of Supplies for BRASS FOUNDRIES.

<Standard> Flask.

Finished Hardware Specialties to Order.

Not milled with Emery Wheels, but accurately planed

Which is your choice. We make both styles.

ESTABLISHED 53 YEARS

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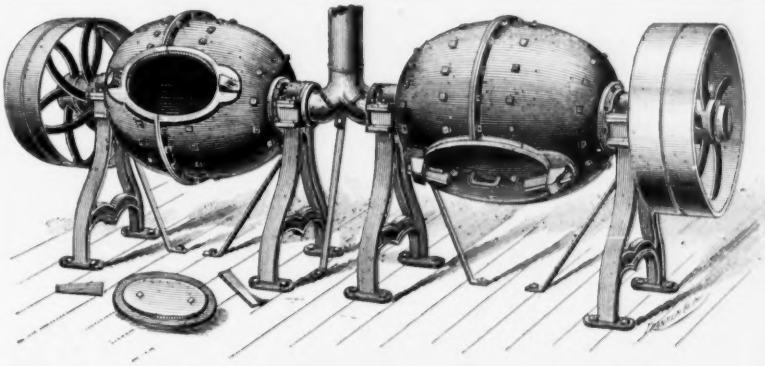
Low Quotations Promptly Furnished.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does double the work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

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Stover Manufacturing Co.

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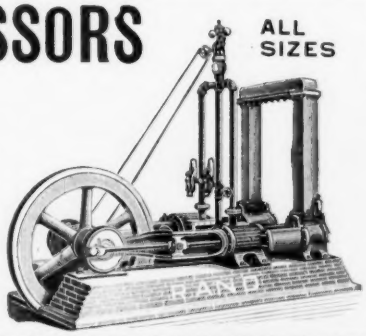
RAND AIR COMPRESSORS

FOR FOUNDRIES.

SIMPLE. DURA LE. ECONOMICAL.

Our **Duplex Compressor,** Compound Air Cylinders, with Inter-Cooler and Compound Steam Cylinders, with Meyer Cut-off Valves, is the best construction for small and medium sizes.

ALL SIZES



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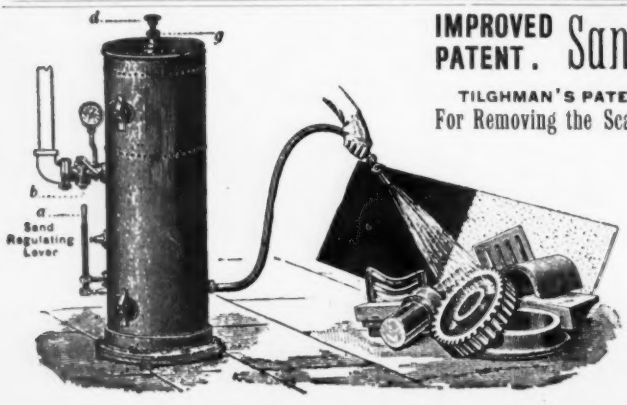
Don't forget our Rock Drills. 100 Broadway, NEW YORK.



IMPROVED PATENT. Sand Blast Machinery

TILGHMAN'S PATENTS. MATHEWSON'S PATENTS.

For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

WARD & NASH,

SOLE AGENTS,

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Send for Catalogue.

There is no Escape

from financial loss for the man who will persist in throwing castings away simply because . . they contain a small hole or leak.

SMOOTH ON will cure permanently 90% of all the defects found in castings. It will stick to the casting till doomsday and even experts cannot tell the difference between a perfect casting and one made perfect by SMOOTH ON.

Write for a Sample Can today. It is the handiest thing you ever saw around a foundry.

SMOOTH ON MFG. CO.,
VREELAND TOMPKINS, Mgr.
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Iron Roof for Sale

Width of building, 155 feet out to out; divided into a center span 66 feet, with a wing on each side 43 feet, 6 inches; total length of the building, 350 feet. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an Iron Foundry, but owing to the failure of the purchaser, is now offered for sale at a bargain. Is admirably adapted for a Foundry for light or heavy castings, Machine Shop, Car Barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.

Apply to

The Berlin Iron Bridge Company,
EAST BERLIN, CONN.

Heyl & Patterson

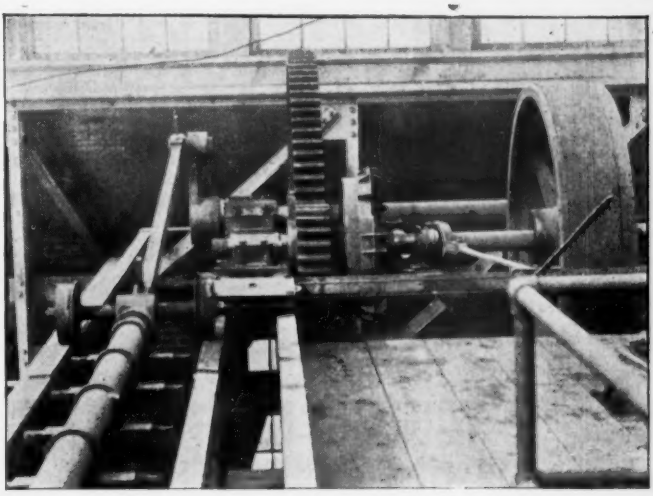
ENGINEERS AND CONTRACTORS,
PITTSBURG, PA.

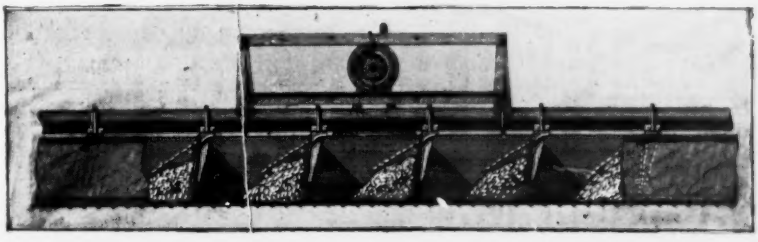
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.



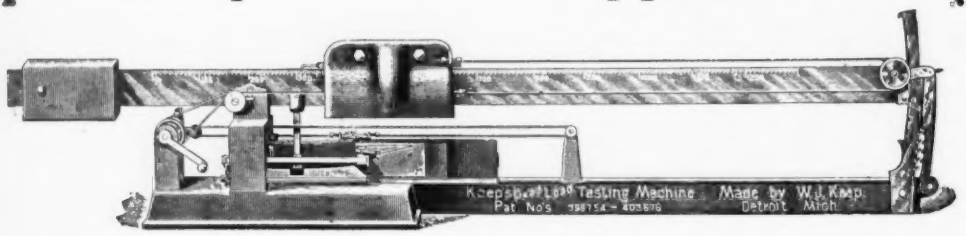


Views of 230 foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

"Keep's Test" Apparatus.



PROSPERITY consists in making money when selling castings at the present low prices.

HOW? Adopt modern devices. Some save $10.00 per day in the cost of mixture by regulating silicon by . . . . . .

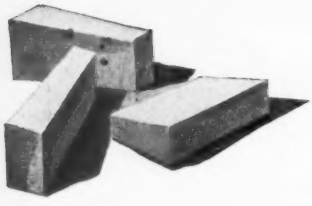
"KEEP'S TEST."

TO SAVE MONEY IN YOUR OWN FOUNDRY, ADDRESS **W. J. KEEP, Detroit, Mich.**

ARE YOU "MARRIED"

to the supply man you are buying of, or does the matter of price and quality concern you? If the latter we can interest you. The progressive foundryman is the one who is always looking out for the best thing in the market at the lowest price.

IF YOU ARE NOT "MARRIED"



to your supply man, try our **"Lakeside"** fine sand, or our **"Hillsdale"** for medium and heavy work. **"Franklin Crown"** or **"Wigton Steel"** Cupola Blocks and **FIRE BRICK** also deserve your attention.

Garden City Sand Co., * * SECURITY BUILDING, CHICAGO.

Which do you wear most

your thinking cap or your working cap? The foundryman who studies to save himself labor and expense, who strives to have his castings make the best possible appearance, finds nothing so helpful as

Kelly's Plumbago

It does the work on all grades of castings and a dollar's worth of it goes further than a dollar's worth of any other man's plumbago.

Samples, if you write for them.

T. P. Kelly & Company, MILLS AT . . Reissing, Pa. Bloomsbury, N. J.

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121-127 N. Ada Street, cor. Kinzie, CHICAGO.

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LIQUID CORE COMPOUND

Used by many of the largest and well-known Iron and Brass Foundries in the United States, Canada, Great Britain and Germany. It is the standard article for making cores.

Send for Decriptive Circular.

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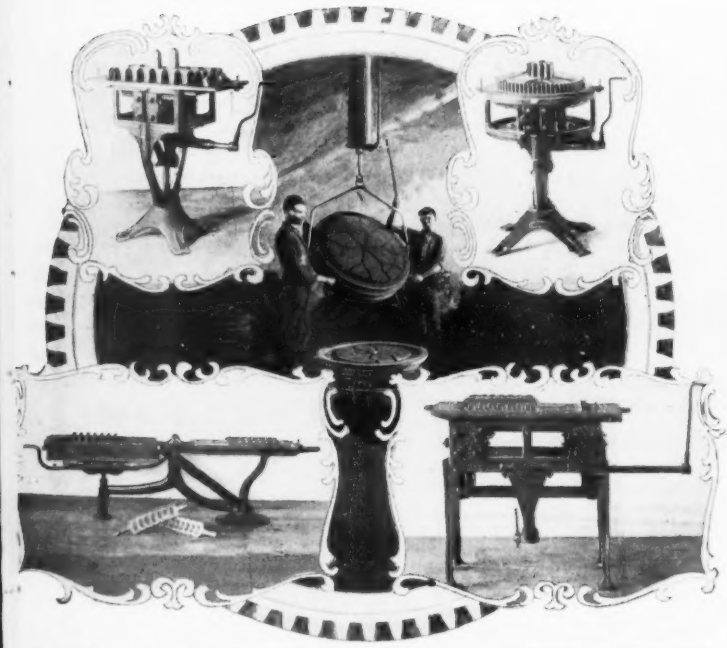
VIA

LAKE SHORE—BIG FOUR LINE

Through Trains with Parlor and Sleeping Cars leave Detroit from foot of Brush Street, landing you direct in **Grand Central Union Station,** Cincinnati. Positively the only line avoiding depot transfers to any point South.

E. O. McCORMICK, Pass. Traffic Manager, CINCINNATI. H. J. RHEIN, General Agent, DETROIT.



Rights to use these machines for molding malleable iron or steel castings are reserved.

In this Illustration

are shown a few examples of special molding machines built . . for special purposes. No ready made molding machines can . . . compete with them. If you have work for a machine, have one built that will fill the bill. When you get a **"Pridmore"** you get a special machine, and not some stock affair, calculated to mold . . everything and molding nothing.

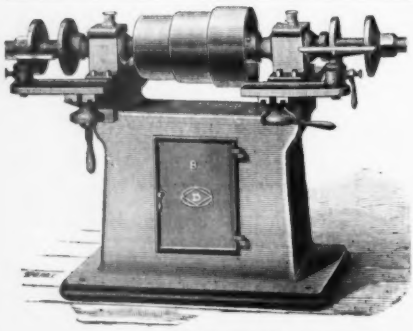
HENRY E. PRIDMORE, 111-113 W. HARRISON ST., CHICAGO

BE WISE

THE GOBEILLE PATTERN COMPANY

(PROMPT AND RELIABLE)

CLEVELAND, OHIO



No. 8 GRINDER.

If you want a

Big, Heavy Grinder

For foundry work, here it is. We also have smaller and larger sizes. Our catalogue No. 19 tells all about them.

DIAMOND MACHINE CO. Providence, R. I.

DO YOU MAKE LIGHT OR HEAVY

Dry Sand and Skin Dried Work?

IF SO, YOU SHOULD USE

McCORMICK'S EXCELSIOR BLACKING.

It makes as clear and smooth a casting as the best plumbago and better than the silver leads. Not an experiment—in use in the largest foundries. A trial will satisfy you of its value.

MADE ONLY BY

J. S. McCORMICK CO., PITTSBURG, PA.

FOUNDRY MOLDING MACHINES, STRIPPING PLATE MACHINES, PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1875.

STOW MANUF'G CO.,

BINGHAMTON, N. Y.

INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

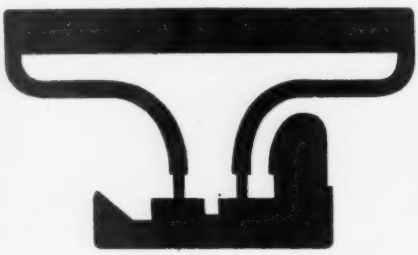
WRITE US FOR CATALOGUE AND PRICES.

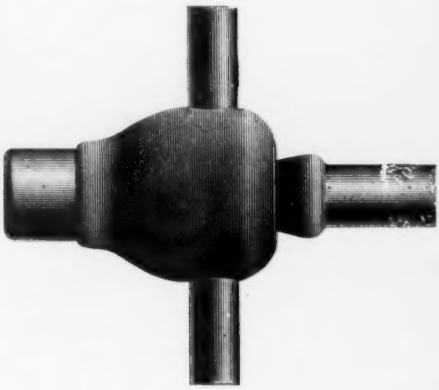
WE HAVE NOT BEEN SATISFIED

WITH producing the leading Core Compound in the world, but have been constantly on the lookout for ways and means by which it could be placed in the hands of the foundryman at the lowest cost.

For the past year we have conducted extensive experiments with a new combination of materials, which, while having all the excellent qualities of our present product, can be sold at a **great reduction in price,** our object being to make profitable for large users to handle as well as small.

We are now ready to fill orders for this latest Core Compound, and to our many customers everywhere we extend an invitation to send for a sample. We guarantee better results, cost and quality of cores both considered, than can be obtained with any other material employed as a binder in the making of cores.





P. S.—It will pay you to send for prices delivered to your R. R. station.

HOLLAND LINSEED OIL CO., 683 Austin Ave., CHICAGO

Special Announceme

Mr. T. L. Griffit

. . and . .

Mr. John Hill

are no longer in o
employ.

The S. Obermayer Com

CINCINNATI, O. CHICAGO, ILL. ST. LOU

Some of Our Specialties.

East India Plumbago,

MOLDERS' TOOLS.

India Silver Lead,

RIDDLES.

Perfect Core Wash,

SHOVELS,

Heavy Stove Plate Facing,

BELLOWS,

Return Stove Plate Facing,

BRISTLE BRUSHES,

Heavy Machinery Facing,

STEEL WIRE BRUSHES,

Car Wheel Facing,

SPRINKLING POTS,

Pipe Blacking,

WHEELBARROWS,

Core Compound,

LADLES,

Cream Soapstone Facing,

FOUNDRY BUCKETS,

Selected Charcoal Facing,

PATTERN LETTERS,

Ice Machine Charcoal,

SNAP FLASKS,

Sea and Stone Coal Facing,

CHAPLETS,

TALC,

(FRENCH, ITALIAN or AMERICAN.)

A Glance . .

AT THE Map will convince you that our position to promptly serve you is superior to that of any other house. With our mills and factories located close to raw materials and our distributing points divided with a view of best serving our customers, we are confident of being able to supply reliable goods (in a hurry, if we have to) at a price that will be satisfactory to the consumers. Write us if you are having any difficulties in producing good castings. We will help you out.

THE S. OBERMAYER CO., CINCINNATI, O., and CHICAGO, ILL. . . . . Factories at LARIMER, PA., and WHITE HAVEN, PA. . . . . .

AT THE BEGINNING of the century the foundryman was in a different position from what he is to-day. But little choice existed in those days as to what he was going to use. What was found in his immediate vicinity generally had to satisfy his wants. All the facilities of the present were unknown to him, yet let us agree that he really managed to turn out some creditable jobs.

What splendid strides the foundry industry of America has made in ninety-seven years. Every man to his own business is what forces any trade forward. With all reverence for the past, are not the manufacturers of foundry supplies entitled to part of the credit for the improved appearance of the castings being made to-day? By tending to *their* business, they have supplied the founder's . . . wants with superior articles at the minimum cost.

The old firm of **J. W. Paxson & Co.** were the pioneers in introducing improvements in foundry practice. At the end of the century our long existence is sufficient proof that our services have been well rendered.

Wishing you a record-breaking year during 1898, we shall be pleased to have a continuance of our pleasant relations.

Prosperity for you means prosperity for us.

J. W. PAXSON CO

PIER 45 NORTH,

PHILADELPHIA, PA.

A Word

as to

Joseph Dixon Invented the Plumbago Crucible

DATE OF INVENTION
1826.

Dixon's Crucibles have been in the Market SEVENTY YEARS.

Dixon's Plumbago Crucibles

Dixon's Crucibles are Standard all over the **GLOBE.**
Dixon's Crucibles are used in every country on the Globe where metals are melted.
Dixon's Crucibles have the highest records for **HEATS.**
Dixon's Crucibles are made to get

BEST RESULTS WITH THE LEAST COAL.

Dixon's Crucibles are made of many mixtures to suit all kinds of work.
Dixon's Crucibles are made special for Steel Melting.
Dixon's Crucibles are made special for Nickel Melting.
Dixon's Crucibles are made special for Brass Melting.
Dixon's Crucibles are made special for Composition Melting.
Dixon's Crucibles are made special for Phosphor Bronze Melting.
Dixon's Crucibles are made special for German Silver Melting.
Dixon's Crucibles are made special for the Melting of Precious Metals.

In ordering you will be benefitted by mentioning the kind of Metals melted. Write for pamphlet **"How to Use Plumbago Crucibles."** The best are the cheapest, as they must stand the punishment of high heat and much wear and tear. The "Dixon" records in average efficiency, in general good behaviour and in volume of sales, far in the lead.

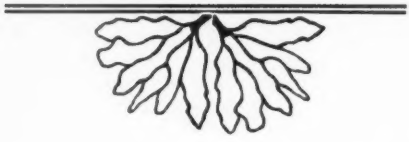
Jos. Dixon Crucible Company,

JERSEY CITY, N. J.

Whitehead Brothers Company,

DEALERS IN

Molding Sand



FIRE SAND,
PHILADELPHIA SAND
FRENCH SAND,
FIRE CLAY, KAOLIN,
FOUNDRY FACINGS
and SUPPLIES
OF ALL KINDS.
LEAD FACINGS
A SPECIALTY.

Albany Sand for Brass and Stove Plate Castings.

537-39 West 27th St.,
NEW YORK.

Providence Office,
42 S. Water Street.

Buffalo Office,
70 and 72 Columbia St.

WORKS AT

CHEESEQUAKE CREEK, N. J.
SOUTH RIVER, N. J.
RARITAN RIVER, N. J.
SOUTH AMBOY, N. J.
WAREHAM, MASS.
CENTRE ISLAND, L. I
WATERFORD, N. Y.
ALBANY, N. Y.
CEDAR HILL, N. Y.
COXSACKIE, N. Y.
CLINTON POINT, N. Y.
ATHENS, N. Y.
COEYMANS, N. Y.
WILLOW SPRINGS, N. Y.
POUGHKEEPSIE, N. Y.
CRESCENT, N. Y.

THE WORLD'S BEST!

CEYLON LEAD FACING.

STOVE PLATE FACING.

PINE LIMB CHARCOAL.

STOVE PUTTY.

GERMAN LEAD.

ALBANY MOLDING SAND.

PIPE BLACKING.

MANUFACTURED BY

ALBANY FACING MILL CO.

ALBANY, N. Y.

Established 1872. Incorporated 1895.

McCullough-Dalzell Company

PITTSBURGH, PA.

CRUCIBLES for Brass Melting .

CRUCIBLES for Steel Melting .

CRUCIBLES for All Purposes . .

CRUCIBLES of All Sizes . . .

STOPPERS. Twenty-one Styles .

LIDS, COVERS, CAPS, . . .

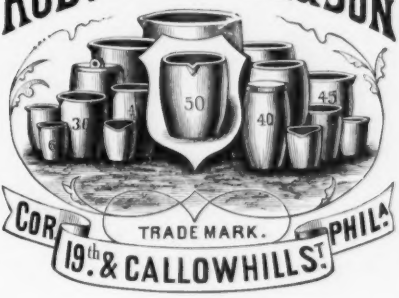
PHOSPHORIZERS . . . .

PLUMBAGO FINE DUST . . .

ALL ARTICLES CONTAINING PLUMBAGO

Crucible.

ROBT. J. TAYLOR & SON



Crucible

Dipper.

Cover.

Stopper.

Crucibles

For melting Steel, Brass, Copper, Gold, Silver, Nickel and Metals and Alloys of Every Description; SmallCrucibles for making Assays and fine pure Plumbago for lubricating, etc.

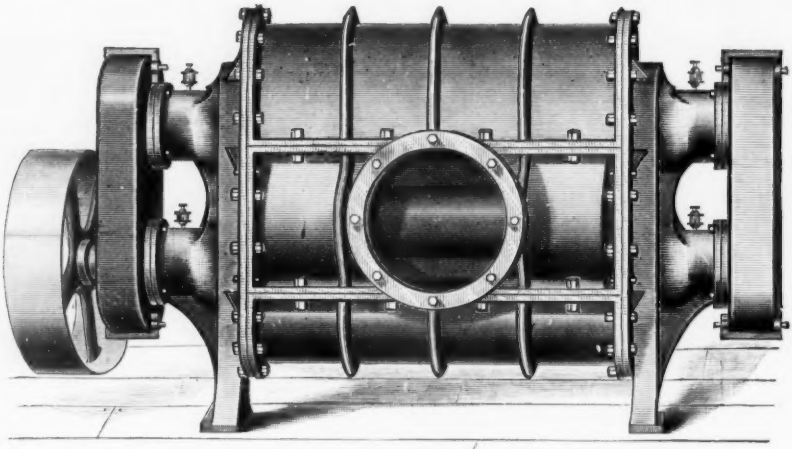
We are practical workmen and have studied the requirements of the different metal works in this country, as well as in Europe. We also work strictly by chemical analysis, giving a uniformity at all times never before approached in this or any other country.

We make All Sizes, from 8 oz. to 2 ton Capacity.

ROBT. J. TAYLOR & SON,

1900 to 1916
CALLOW HILL STREET, PHILADELPHIA, PA.

The Green Rotary Pressure Blower



Working parts are two perfectly balanced impellers, mounted on the best steel shafts, running in bronze bushes, cut gearing at both ends of the Blower enclosed in oil-tight casing.

Weighs less, occupies less space, costs less for freight than any other POSITIVE BLOWER in existance.

FOUNDRY BLOWERS

High Pressure Blowers

GAS EXHAUSTERS

Exhausters for Hot Gases

The GREEN Gives the Most Value for a $.

Wilbraham Baker Blower Co.,

2518 Frankford Ave., PHILADELPHIA, PA.

ROOTS'

Rotary Pressure Blower

Is used in almost every Country on the Earth's surface.

THEY REPRESENT

In their manufacture the concentrated experience and wisdom of some of the world's best mechanics and have become famous for the perfection of their workmanship, as well as their efficiency and economy.

A LONG TIME—FIFTEEN YEARS. LITTLE ATTENTION.

Camden, N. J., April 24, 1893.

P. H. & F. M. Roots Co., Connersville, Ind.:

Dear Sirs—Answering your favor of the 18th, would state that we were hardly aware we had been using your blower for such a long time—over 15 years. It is still giving us good satisfaction, and has cost very little for repairs, and required but little attention.

Yours truly,

JOHN H. DIALOGUE & SON.

IN SERVICE FROM 1866 TO 1891.

Cincinnati, O., March 2, 1892.

P. H. & F. M. Roots Co., Connersville, Ind.:

Gentlemen—We have been using Roots Blowers since 1866, two No. 4's having been in service from that date until 1861; they were then removed and one No. 6 substituted, and our experience with them has been perfectly satisfactory.

Yours truly,

THE LANE & BODLEY CO.

IT FULLY MEETS OUR REQUIREMENTS.

Milwaukee, Wis., March 5, 1892.

P. H. & F. M. Roots Co., Connersville, Ind.:

Gentlemen—We have thoroughly tested the No. 7 Blower furnished us by you, and are pleased to say it fully meets our requirements and is satisfactory to us in every particulars.

Yours truly,

THE FULLER-WARREN CO.,
H. A. Viets, Vice-President.

P. H. & F. M. Roots Co., Connersville, Ind.

NEW YORK OFFICE, 109 Liberty Street.

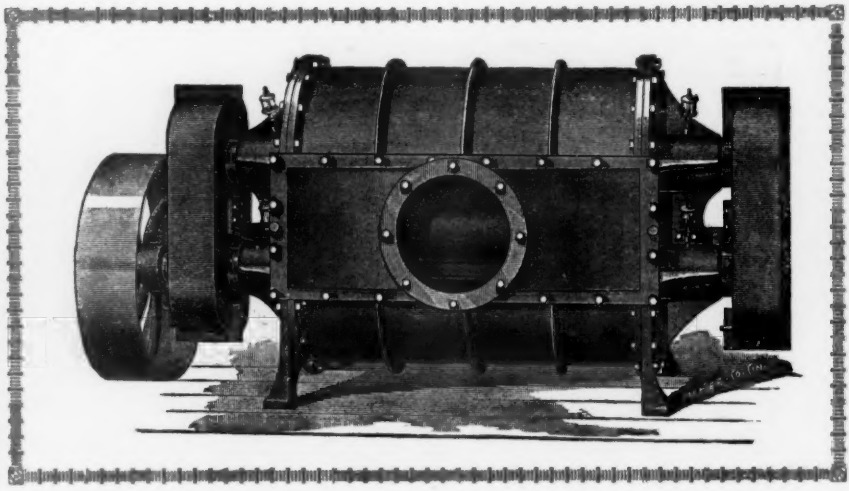
. . . OVER . . .

30,000

HAVE BEEN PUT
ON THE MARKET

ROOTS' . .

Positive.. Pressure Blowers..



OUR BLOWERS

Embody an experience of forty years' in the construction of machines of this type . . . . . .

P. H. & F. M. ROOTS Co.

CONNERSVILLE, IND.

NEW YORK OFFICE, 109 Liberty Street.

P. C. COCHRAN, PRESIDENT.
J. H. WURTZ, SECRETARY.

J. R. LAUGHREY, TREASURER.
J. S. NEWMYER, MANAGER.

WASHINGTON COAL & COKE CO.

CAPITAL, PAID UP, $500,000.

3500 Acres of Coal. 3500 Tons Daily Capacity.

300 30-TON GONDOLA CARS — 50 30-TON COKE CARS.

Shipments of Coal commenced November 23 1893.
" Coke " August 29, 1894.

Coal shipped during	1893	3,750 Tons.
Coal and Coke shipped during	1894	204,500 "
" " "	1895	370,000 "
" " "	1896	353.000 "
" " "	1897	750,000 "

GENERAL OFFICE—
DAWSON, FAYETTE CO., PA.

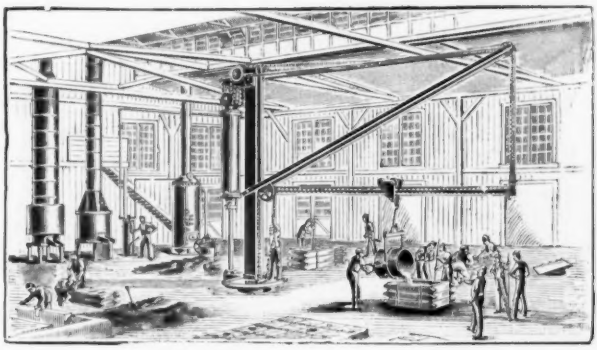
SALES OFFICE—PITTSBURG, PA.
N. P. HYNDMAN, SALES AGENT.

MAKING IRON MEN RICH!

That's what the Ridgway Cranes are doing all the time.

"Come, come, Ridgway, don't get extravagant. The very idea of just a crane, however meritorious, making anybody rich!"

Fact though, brother, whether you believe it or not. Of course, you don't understand how it can be, because you don't understand the Ridgway crane. You probably think one power crane is as good as another, so it works up and down all right. That just where you "break yer merlasses jug," as Uncle Remus says. A crane that goes into a foundry, for example, and simply by its presence enables the very same molders for the very same wages to turn out 50 per cent. more work, is not an ordinary crane. Honestly now, is it?



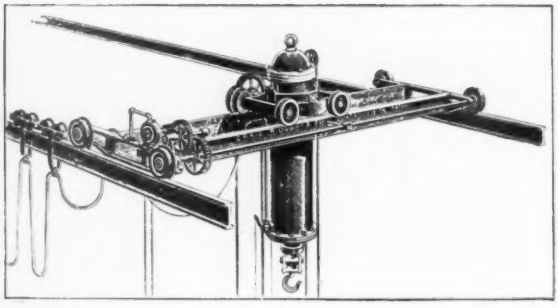
5-ton Steam-Hydraulic Crane in a Foundry.

The only thing you have to concern yourself about is just this:—is that statement true?

That's why we keep a-yelling at you from one year's end to the other in this queer kind a' advertising way of ours, "Investigate! Investigate!! Investigate!!!"

If you care to come and see us, you will find us driving our works as hard as we can day and night in order to make these wonderful cranes fast enough for those who have investigated it. They are not buying Ridgway cranes for either health or ornament, indeed they are not. We tell the truth, brother, or we would have been out of the business long ago. What is it Lincoln said about not fooling the people all the time?

Air Hoists! No Profanity



is needed to work these Oil Governed Hoists. No jerk and molds torn to pieces. No Air Gun business because the load slips off the hook or a careless hand is at the valve. A little oil in the piston rod makes the air hoist perfect and absolutely safe. If you need air hoists, don't get any other than the Ridgway Oil Governed kind. Our circular describes it.

"PLEASE TAKE THE ELEVATOR."

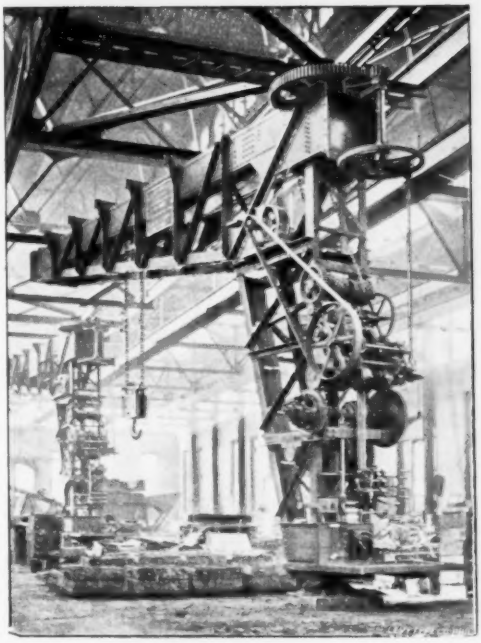
A MAGNIFICENT HYDRAULIC
THAT DON'T REQUIRE A PUMP.

CRAIG RIDGWAY & SON, COATESVILLE, PA.

William Sellers & Co., Incorp.

PHILADELPHIA.

MODERN FOUNDRY MACHINERY



In connection with our Machine Tool Business, we conduct a large foundry where practical tests are continually made of new labor-saving devices. The manufacture of

IMPROVED FOUNDRY CRANES

has become an important feature.

This illustration shows a . . . . . .

Quick-Acting Electric Jib Crane

built by us and erected in the foundry of the Baldwin Locomotive Works. A similar crane in process of erection appears in the background.

Centrifugal Sand Mixer

Since the introduction and favorable reception of this effective, expeditious and economical **machine for preparing sand for molds and cores** we have simplified its construction and cheapened its cost. The capacity of the machine is remarkable, being limited only by the facilities for feeding sand into the hopper. Two men will easily shovel 5 tons an hour into the machine.

The qualities of "toughness" and "porosity" are materially improved by this process of preparing molding sand.

DIRECTORY OF LEADING PIG IRON DEALERS.

MATTHEW ADDY & CO.
CINCINNATI, ST. LOUIS.
Agencies,
Chicago, Detroit, New York,
Philadelphia. Pittsburg.

CLINTON IRON & STEEL CO.
Manufacturers of the
CLINTON INSPECTED FOUNDRY IRON
CELEBRATED "CLINTON" SOFTENER
PITTSBURG, PA
15 Cortlandt St., NEW YORK.

DAYTON COAL & IRON CO.
(Limited)
PIG IRON,
Dayton, Tenn. Cincinnati, Ohio.

THE DOMHOFF & JOYCE CO.
PIG IRON-COKE.
CINCINNATI

F. A. COODRICH & CO.
Incorporated
PIG IRON, STEEL, COKE, ETC.
Detroit, Mich.

M. A. HANNA & CO.,
COAL, IRON ORE
and PIG IRON.
Cleveland. Ohio.

THOMAS A. MACK,
PIG IRON,
Cincinnati, - - Ohio.

PICKANDS, BROWN & CO.,
Manufacturers, Importers
and Dealers in
PIG IRON AND IRON ORE.
Rookery Building, CHICAGO.

PILLING & CRANE,
PIG IRON and COKE,
Carnegie Building,
PITTSBURG, PA.
Girard Building,
PHILADELPHIA, PA.

ROGERS, BROWN & CO.
CINCINNATI, CHICAGO,
BUFFALO,
PHILADELPHIA, NEW YORK,
ST. LOUIS

STEVENSON, FIELD & CO.
PIG IRON and COKE,
Columbus, O. St. Louis, Mo.

Blower on Adjustable Bed.

THE STURTEVANT STEEL Pressure Blowers,

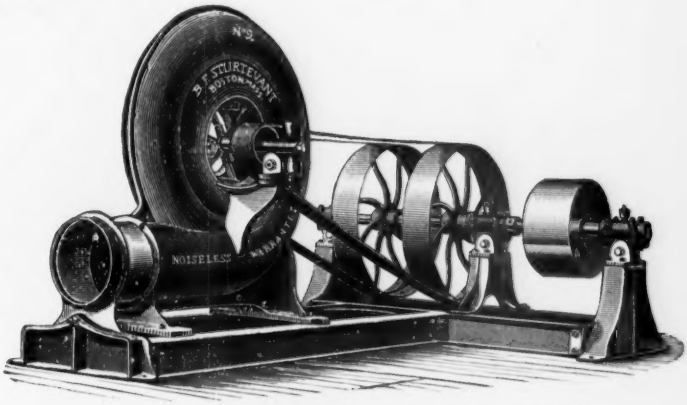
—FOR—

Cupola Furnaces and Forge Fires.

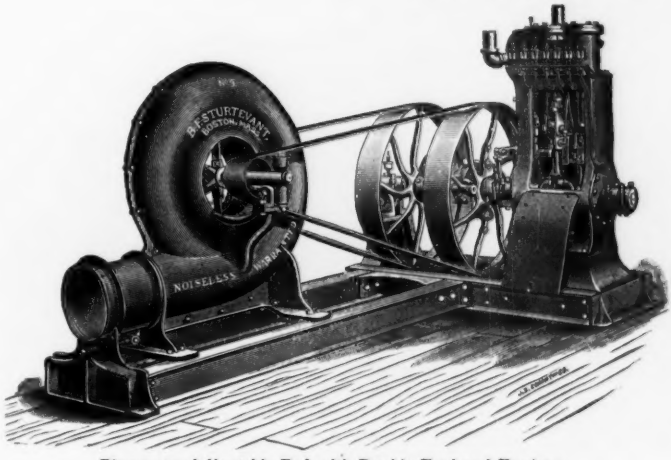
BLOWERS

Furnished without Bed with Separate Countershaft

BLAST GATES



Blower on Adjustable Bed with Combined Countershaft.



Blower on Adjustable Bed with Double Enclosed Engine.

BLOWERS

WITH

THE STURTEVANT

Direct Connected

Electric Motors

Send for Catalogue.

B. F. STURTEVANT CO.,

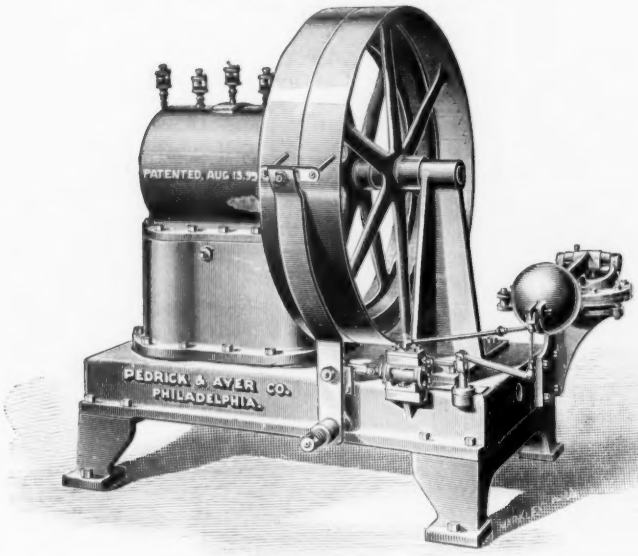
BOSTON, MASS.

131 Liberty Street, NEW YORK. 135 N. Third St., PHILADELPHIA.
16 S. Canal St., CHICAGO. 75 Queen Victoria St., LONDON.

STOCK CARRIED AT BRANCHES.

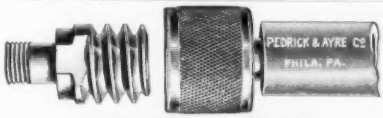
Automatic Compound Belt Air Compressors.

PATENTED AUGUST 13TH 1895.



Straight Lift Hoist. **Built in two sizes, Nos. 1 and 2.**

No.	Size of Cylinders in Inches	Revolutions per Minute.	Cubic Feet of Free Air	Horse Power Required.	Size of Pulleys in inches	Shipping Weight of Compressor	Floor Space in inches	Telegraphic Symbol
1	11x 6 6x 6	100-160	32- 50	2-3½	40x5	2875 lbs.	60x40	Parian
2	15x10 8x10	90-120	90-120	9-15	60x6	5370 lbs.	76x60	Parish



AIR HOSE COUPLING

For ½ inch, ¾ inch and 1 inch Hose.

These Compressors will compress more air at less cost than any other make, requiring no attention other than oiling; entirely automatic in action, stopping and starting as air is required. Specially adapted for foundry use. Can be run in series, if so, no stoppage impossible.

Horizontal Air Lift for low ceilings; for general lifting, quick in action and under perfect control of operator.

Straight Air Lift for foundry purposes when equipped with retaining and releasing valve, will hold the load whether heavy or light, in the desired position, as in case of lifting a ladle of molten iron and pouring it or raising a flask to knock out the sand. It can neither ascend or decend as long as connected to air supply.

Air Hose Couplings are designed to do away with long lines of hose. By having suspended along the air line a number of hose equipped with this device, connections can instantly be made or disconnected, allowing one hoist to serve in several places. Each size made in duplicate. Containing a shut-off valve.

Send for circulars and details to Pedrick & Ayer Co., Pneumatic Department.

PEDRICK & AYER CO.

SPRING GARDEN STATION, PHILADELPHIA, PA.

Manning, Maxwell & Moore, *Sole Agents*, 111-113 Liberty St., New York City. 60 South Canal St., CHICAGO, ILL. 424 Telephone Bldg., PITTSBURG.

We Guarantee..

That one man with one of our **PNEUMATIC HAMMERS** can do more and better work than four men working in the ordinary way.

These same Hammers are also especially adapted for calking boilers and beading flues.

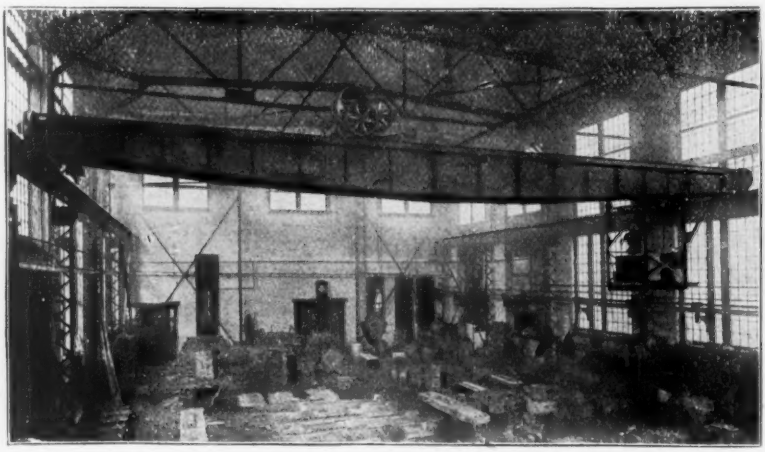
We also manufacture the best Air Drill on the market, and our Air Hoist and Compressors are especially designed for foundry work.

All tools sent on ten days' trial, subject to approval and are guaranteed for one year.

Chicago Pneumatic Tool Co.,

635 Monadnock Building, CHICAGO, ILL.

Three Motor Electric or Compressed Air Traveling Cranes



ELECTRIC THREE MOTOR TRAVELER, 50-FOOT SPAN.

Modern Cranes are necessary to produce work economically.

JIB CRANES (HAND OR POWER), AIR HOISTS

THE LEADING FOUNDRIES USE THE WHITING CUPOLA.

Made in 14 Sizes.

COMPLETE FOUNDRY EQUIPMENTS FURNISHED.

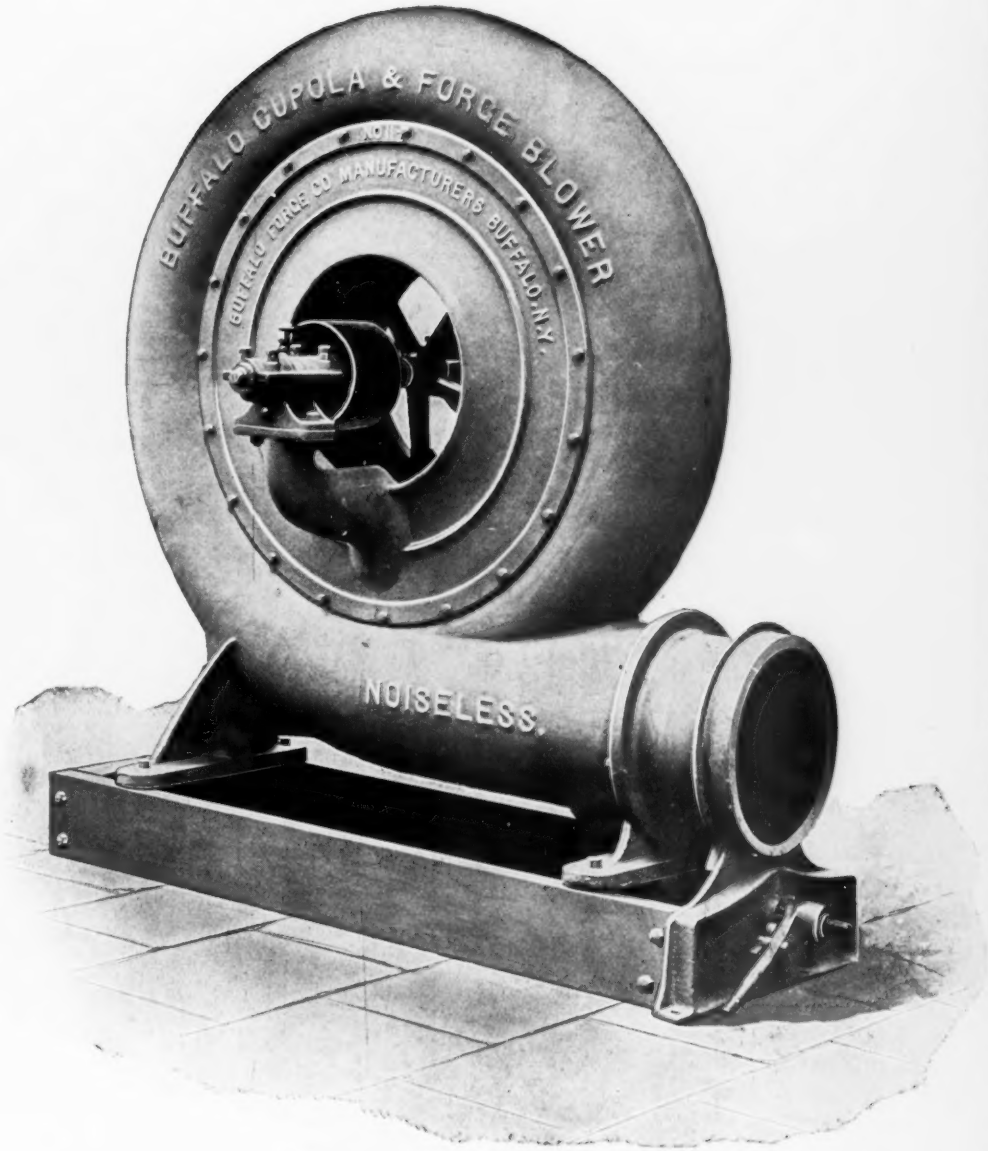
THE AVERY MOLDING MACHINE.

Prices on application.

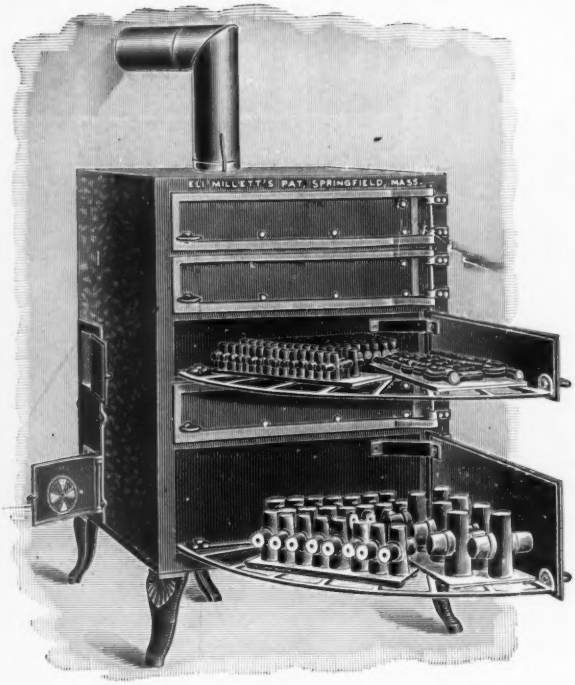
SEND FOR CATALOGUE.

Whiting Foundry Equipment Co.

Works, HARVEY, ILL. (Chicago Suburb.)



A BUFFALO BLOWER—ENOUGH SAID.



Millett's Patent Core Oven

THE BEST IN THE WORLD.

No Foundry using small Cores can afford to be without it.

Over one hundred and fifty in use.

Send for our new Catalogue giving names of those using them.

Millett Core Oven Co.

BRIGHTWOOD, MASS.

For Sale by THE J. W. PAXSON CO., Philadelphia, Pa., and THE S. OBERMAYER CO., Chicago, Ill.

Clinton Iron & Steel Co.

"FAIR DEALING" Their Motto.

MANUFACTURERS OF

"CLINTON" AND "HECTOR"

INSPECTED FOUNDRY IRONS . . . . .

ALSO

Sole Factors for DUNBAR STRONG IRON

In New York and New England.

FURNACES, PITTSBURGH.

NEW YORK OFFICE, No. 15 Cortlandt St.

Why deal with Commission people or Agents who give fancy names to Irons and know nothing about their manufacture

DEAL WITH THE MANUFACTURER DIRECT.

ESTABLISHED 1854.

Brooklyn Fire Brick Works

CUPOLA BLOCKS, FIRE SAND, FIRE CLAY, FIRE MORTAR, KAOLIN

AND ALL FIRE MATERIAL REQUIRED FOR FOUNDRY PURPOSES.

Send for Illustrated Catalogue and Prices.

88 Van Dyke Street, BROOKLYN, N. Y.

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THE FOUNDRY

The only foundry paper published in the world, and an authority on all matters pertaining to the foundry business.

RATES OF SUBSCRIPTION.

Single subscription to all parts of the United States and Canada, $1 per annum.
" " Universal Postal Union, 1.75 "
Eight or more subscriptions at one time, 75 cents each.

ADVERTISING RATES.

One page - -	per month, $25.00
Half page - - -	" 15.00
Quarter page - -	" 8.50

When space is specified an extra charge of five per cent. on the above figures will be made. All pages between front cover and reading matter reserved for whole page advertisements.

Advertisers in THE FOUNDRY have the privilege of discontinuing their advertisements at any time after they have had three insertions, and will only be charged pro rata for the number of insertions printed. They also have the privilege of changing advertisements as often as desired.

The publishers of THE FOUNDRY appreciate the fact that it is customary for publications, especially the class known as Trade Journals, to quote a rate for advertising from which greater or less discounts are given, according to the persistency of the advertiser. This system is manifestly unfair as tending to show partiality. We have deducted the usual discount before quoting rates thus giving it to all alike, and no reduction of any sort on the above rates can be made.

Copy for advertisements must be in by the 20th of the month preceding publication to insure insertion.

The Coburn Patent Trolley Track

PARLOR DOOR HANGERS.

The adjustment is in the Track and not in the Hanger, as are others.

☞Send for Book.

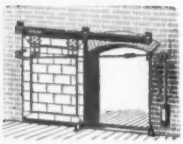
The Coburn Patent Trolley Track

BARN DOOR HANGERS.

Impossible for door to jump the track. Very simple and cheap to apply.

☞Send for Book.

The Coburn Patent Trolley Track



FIRE DOOR HANGERS.

Recommended and adopted by fire underwriters all over the United States.

☞Send for Book.

The Coburn Patent Trolley Track

Overhead Tramway

Furnished complete with straight and curved track, switches, frog brackets, single and double carriers.

☞Send for Book.

The Coburn Patent Trolley Track

—AND—

Patent Rolling Ladder Systems

Over 10,000 in use in the U. S. Roll suspended from ceiling or facing the shelves.

☞Send for Book.

The Coburn Trolley Track Mfg. Co.,

HOLYOKE, MASS.

GLUTROSE

(Trade Mark.)

THE UNIVERSAL

Liquid Core Compound

Patented in the United States, England, France and Belgium.

GLUTROSE was invented and is manufactured by a practical foundryman of many years' experience. It has been used in the Pennsylvania Railroad Foundry at Altoona and other large foundries for the past three years with the most satisfactory results.

It is cheaper and better than flour, rosin, oil, molasses or any other compound in use; takes the place of all other materials and never varies in quality.

WILL MAKE FIRST-CLASS RADIATOR CORES WITHOUT RODDING.

WHY PAY 30 to 40 CENTS FOR LINSEED OIL WHEN THE SAME RESULTS CAN BE OBTAINED FOR HALF THE MONEY?

WILL NEVER BLOW THE CASTINGS.

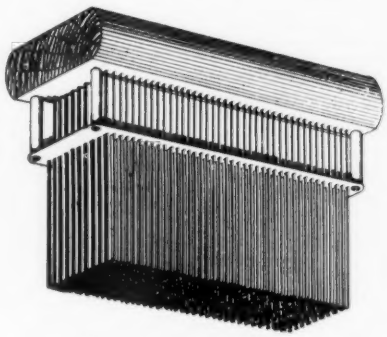
AMERICAN GLUTROSE WORKS

Sole Manufacturers.

OFFICE: PENN MUTUAL BUILDING,

No. 925 Chestnut St., Philadelphia.

Well, it doesn't look like anything you ever saw before



"IRON CLAD."

Guaranteed Satisfaction or Money Back. You Take no Risk.

SPECIAL FEATURES.—Backs all in one piece; the wires uniformly distributed; each wire separately held and protected from excessive strain by a perforated tin plate; maximum stiffness with maximum elasticity; back with rounded sides; lightness combined with strength; elegance with usefulness; best material with finest workmanship; great durability at a moderate cost.

THE BUCHEL BRUSH CO., New Orleans, La.

St. Louis Agents—Todds & Stanley Mill Furnishing Co.

Do You Have Small Imperfections in Castings?

TRY TOMPKIN'S

"Smooth On" Castings Iron Compound.

ITS VALUE IS PROVED BY CONTINUED USE AND INCREASING SALES.

"SMOOTH ON" IRON T COMPOUND CASTINGS

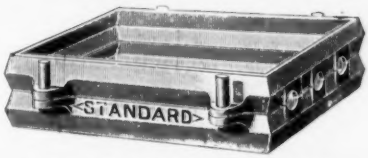
SMOOTH ON MFG. CO. VREELAND TOMPKINS, MANAGER. 551 COMMUNIPAW AVE. JERSEY CITY, N. J.

Estate of Oscar Barnett.

BRUEN, HAMILTON and McWHORTER STREETS NEWARK, N. J.

Manufacturers of Supplies for BRASS FOUNDRIES.

<Standard> Flask.



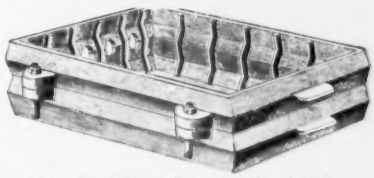
Finished Hardware Specialties to Order.

Not milled with Emery Wheels, but accurately planed

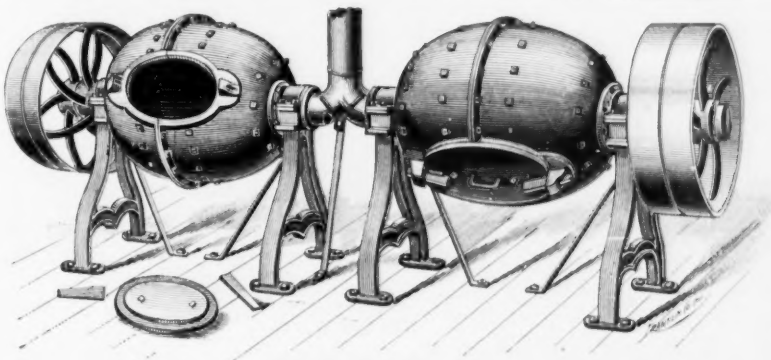
Which is your choice. We make both styles.

ESTABLISHED 63 YEARS

Ribbed Flask.



Low Quotations Promptly Furnished.



A Fine Pair

Stover's IMPROVED EXHAUST Tumbling Barrels

The Stover Egg Shaped Barrel does doublethe work of any other with less noise and power. It gives the contents a double motion or action—from ends to center and from side to center—causing a thorough mixing and rubbing together of all the parts contained therein, cleaning and polishing the contents better and quicker than any other form of barrel.

Sent on 30 days approval to any responsible manufacturer of light castings, malleable iron wire nails, or any other small articles that require cleaning and polishing.

For full particulars, address,

Stover Manufacturing Co.

205 RIVER STREET, FREEPORT ILL

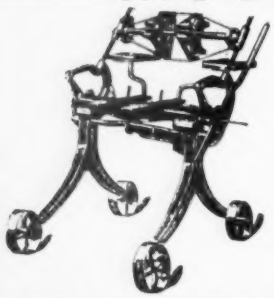
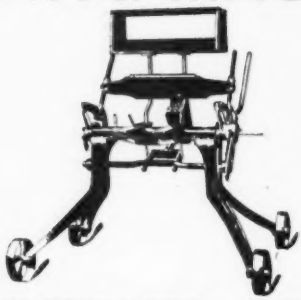
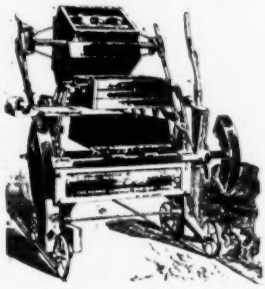
New Patent Countershafts

These countershafts have . . **self-oiling loose pulley** and **self-oiling bearings.** The oil reservoirs are so constructed that after once filling, the countershaft will run months without attention.

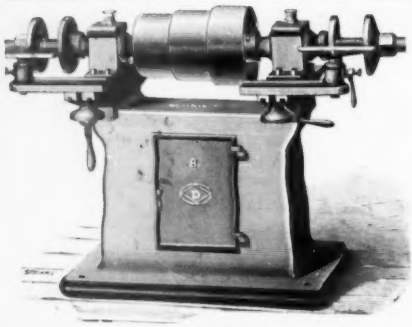
For Sale by Leading Machinery and Supply Dealers Throughout the Country . . . . . .

Builders' Iron Foundry, Codding, Westminster and Dodge Streets, PROVIDENCE, R. I.

FARWELL'S MOULDING MACHINES Send for Catalogue

THE ADAMS COMPANY, DUBUQUE, IOWA



No. 8 GRINDER.

If you want a

Big, Heavy Grinder

For foundry work, here it is. We also have smaller and larger sizes. Our catalogue No. 19 tells all about them.

DIAMOND MACHINE CO. Providence, R. I.

For Heavy Machinery Castings

there is no sand superior to our

No. 6 RED

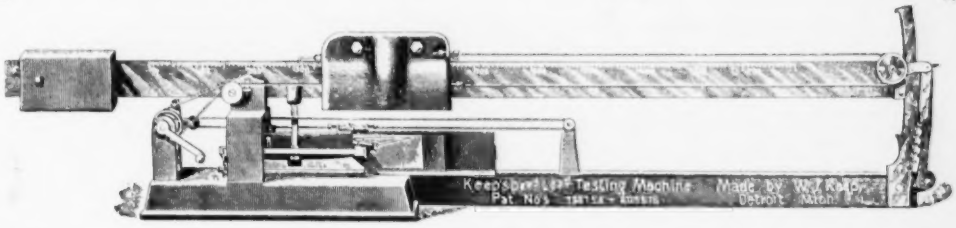
A short time ago, Mr. W. M. Scott, of the P. Hayden Saddlery Hardware Co., of this city, **cast a large anvil base** in green sand, producing with our **No. 6 RED**, a casting which for elegance of finish surpassed anything seen heretofore, and, by the way, there has been a great number of fine castings made in this neighborhood.

The benefits to be derived from a good molding sand are so many that the mere question of first cost should not be given undue consideration. While we are only advertising our **No. 6 RED** in this issue (**we can ship this sand any month in the year**), we are prepared to furnish sand for any and all classes of foundry work. If your customers are kicking, or your own conscience accusing you because your castings are not what they should be, tell us. We have helped others and can help you.

Ætna Sand & Clay Co.

Room 48 Deshler Building, Columbus, Ohio.

"Keep's Test" Apparatus.



PROSPERITY consists in making money when selling castings at the present low prices.

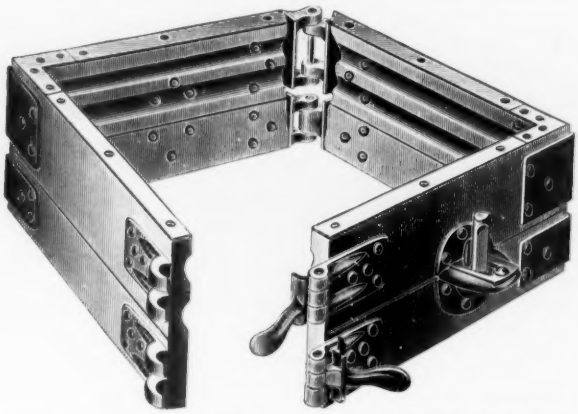
HOW? Adopt modern devices. Some save $10.00 per day in the cost of mixture by regulating silicon by . . . . . .

"KEEP'S TEST."

TO SAVE MONEY IN YOUR OWN FOUNDRY, ADDRESS **W. J. KEEP, Detroit, Mich.**

We can save you money by building your Snap Flasks.

EUREKA IMPROVED SNAP FLASK.



No. 1—Hardwood, 1¼ in. Stock, $2.75 each. No. 2—Whitewood, 1¼ in. Stock, $2.50 each.

Made of the best Kiln-Dried Lumber, Bound with Iron and All Trimmings Riveted. Write for Prices.

C. H. GREEN & CO., Syracuse, N. Y.

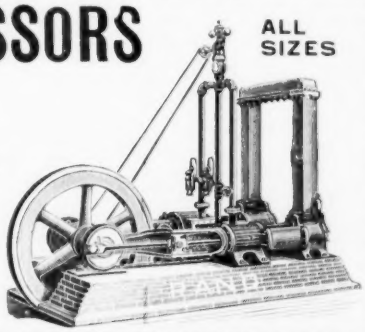
RAND AIR COMPRESSORS

ALL SIZES

FOR FOUNDRIES.

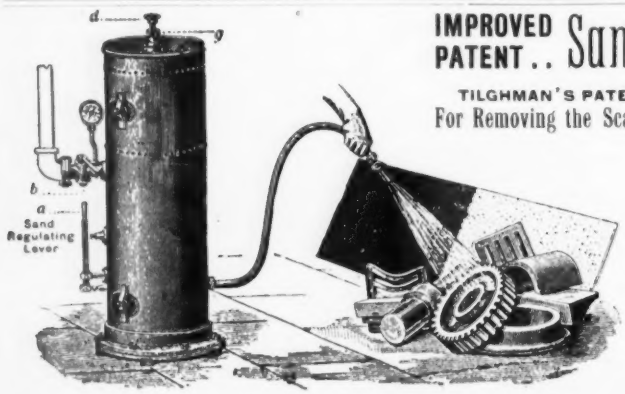
SIMPLE. DURABLE. ECONOMICAL.

Our **Duplex Compressor,** Compound Air Cylinders, with Inter-Cooler and Compound Steam Cylinders, with Meyer Cut-off Valves, is the best construction for small and medium sizes.



RAND DRILL CO.

Don't forget our Rock Drills. 100 Broadway, NEW YORK.



IMPROVED PATENT.. Sand Blast Machinery

TILGHMAN'S PATENTS MATHEWSON'S PATENTS.

For Removing the Scale from Iron and Steel Plates.

Cleaning Castings, Forgings, etc

WARD & NASH,

SOLE AGENTS,

35-37 So. Canal Street, CHICAGO.

23-25 Purchase St., BOSTON.

Send for Catalogue.

Heyl & Patterson

ENGINEERS AND CONTRACTORS,

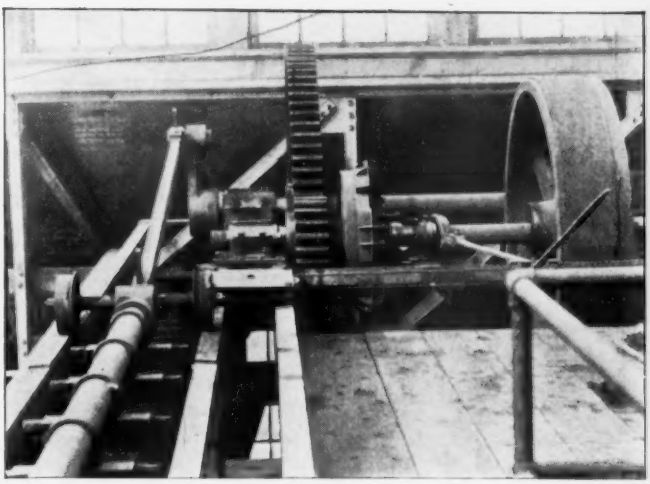
PITTSBURG, PA.

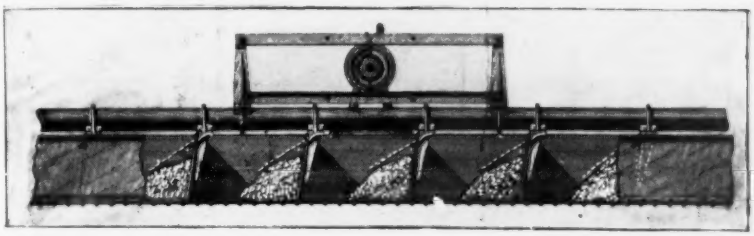
ELEVATING AND CONVEYING MACHINERY.

RECIPROCATING CONVEYORS FOR TRANSPORTING SAND.

FEEDING AND MEASURING DEVICES FOR THE AUTOMATIC TEMPERING OF SAND.

SLOW SPEED, PERFECT DISCHARGE ELEVATORS.





Views of 230-foot Reciprocating Sand Conveyer at Westinghouse Air Brake Co.'s Foundry, . . Wilmerding, Pa.

PATENTS PENDING.

Complete Installations.

EVERY DAY that economical and efficient element known to our Foundries as

CHARCOAL

FACING is gaining ground. It beats all other kinds of Facing for Fine Castings. Let us explain its many virtues to you.

THE SPRINGFIELD FACING CO., Springfield, Mass.

MICHIGAN CENTRAL

"The Niagara Falls Route."

A FIRST CLASS LINE FOR FIRST CLASS TRAVEL.

ROUTE OF THE **"North Shore Limited."**

"As near perfection in the way of construction, appointments, service and able management as can be conceived in modern railroading.—*Extract from report of Railroad Commissioner, State of Michigan.*

O. W. RUGGLES, G. P. & T. Agent, CHICAGO.

A Pound

of **Kelly's Plumbago** will go further in proportion to its cost than a pound of any other plumbago.

This is a claim our competitors try to keep out of sight.

If you buy a suit of clothes, you judge the value by the service they give.

That is the way we want you to measure **Kelly's Plumbago.** Keep track of the amount of work a dollar's worth of Kelly's does as compared with a dollar's worth of any other plumbago. That is the kind of a test that talks.

Don't let anybody bamboozle you with sugar-coated descriptions of their plumbago. Put it to work and see what it does.

Kelly's Plumbago goes further than any other of equal value. We have a standing reward for evidence to the contrary.

T. P. Kelly & Company,

MILLS AT . . Reissing, Pa. Bloomsbury, N. J.

WESTERN OFFICE and MILLS: 284 Pearl St., NEW YORK, N. Y.

121-127 N. Ada Street, cor. Kinzie, CHICAGO.

CINCINNATI, HAMILTON & DAYTON Ry

THE SHORT LINE
BETWEEN
CINCINNATI, INDIANAPOLIS,
DAYTON, LIMA.
TOLEDO and DETROIT.

D. G. EDWARDS, Pass. Traffic Mgr., CINCINNATI, OHIO.

HAVE YOU

GOT MORE OF THE LONG GREEN than your pockets will hold. If you have, send to **Smith** for a **wallet;** if you haven't, send to **Smith** for a **wallet** anyhow and you will find something to fill it all right enough. Who is **Smith?** What does he do? Never mind **Smith's** business; he is giving **wallets** away this month and that will have to satisfy you. **GET ONE!** You will like it. Besides money, they will hold time cards, postage stamps, marriage certificates and neckties Paint your name on the rear of a postal card and chuck it **Smith's** way, saying you saw this in THE FOUNDRY. **Smith** will fire a **wallet** right back at you.

FRANCIS H. SMITH,
AKRON, OHIO.

THIS IS THE SMITH!

BRIDGES BERLIN BUILDINGS

OUR CATALOGUE

OF THREE HUNDRED PAGES ILLUSTRATING AND DESCRIBING A LARGE NUMBER OF

BRIDGES
BUILDINGS
AND ROOFS

Designed and Built by us

Is now ready and will be sent on application.

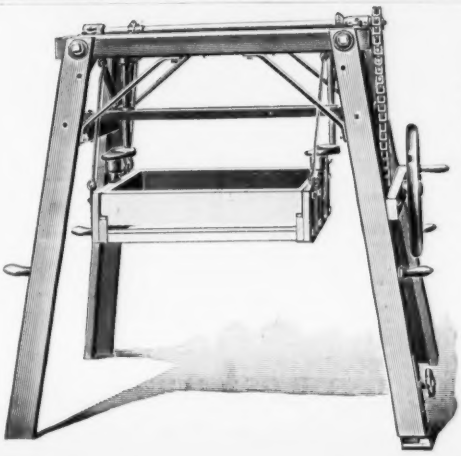
THE BERLIN IRON BRIDGE CO.

EAST BERLIN, CONN.

What good would it do you . . . . .

to advertise Pig Iron, Molding Sand, Bellows, Wheelbarrows and other foundry supplies in Scribner's or Harper's. Those papers are all right for Pear's Soap. They are good papers, too, in their own sphere. Every paper has its own field. THE FOUNDRY has one. More foundrymen read it than all other trade journals combined. If you want to reach this class of people, it is the only medium.

We make patterns cheaper, better and in a fraction of the time required to get them out elsewhere. Do you realize that a small pattern shop is a nuisance? It is either a feast or a famine all the time. The Gobeille Pattern Co., Cleveland, Ohio.



THE PERFECT

Sand Riddling Machine

This is the Best, Simplest, Cheapest, Most Durable and Most Easily Operated Sand Riddling Machine made.

For full particulars and references, address,

THE SPRINGFIELD FOUNDRY CO.

SPRINGFIELD, OHIO.

A Free Discourse

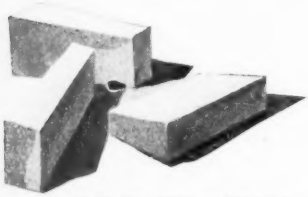
ON **FIRE BRICK**
AND **MOLDING SAND**

may be a good thing, but **RESULTS** are what you want. When lining your **CUPOLA**, try . . . .

"FRANKLIN CROWN" BLOCKS.

If they don't give **RESULTS**, we will replace them **FREE OF CHARGE.**

"WIGTON STEEL" AND "SLIGO" ARE ALSO GOOD BRICK . . . . .



MENTION THE FOUNDRY.

Always Remember . . .

we are the largest dealers in the West in all grades of . .

MOLDING SAND and FOUNDRY SUPPLIES

SEND FOR OUR BOOK.

Garden City Sand Co., * * SECURITY BUILDING, CHICAGO.

WE MANUFACTURE

PLUMBAGO CRUCIBLES

FOR MEN THAT

UNDERSTAND

using them and then they cannot be surpassed in durability; 90 heats have been attained from one crucible. Send for testimonials, quantity and sizes wanted, and we will quote you figures.

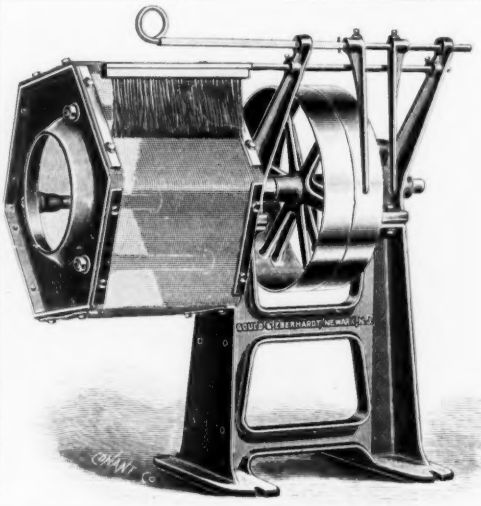
Ceylon Plumbago

PURE and HEAVY, is the only material for FACINGS if you want a bright smooth casting or for a Lubricant or Stove Polish, etc.

We keep it for sale.

Hussman Crucible Co.

ST. LOUIS, MO.



EBERHARDT'S IMPROVED AUTOMATIC SAND SIFTER.

Messrs, Gould & Eberhardt:

NEWARK, N. J. Aug. 19, 1896.

GENTLEMEN:- I have two of your Sand Sifters in use, and find them an excellent device for the preparation of Core and Facing Sand, as they sift and mix thoroughly, run with small amount of power, save the labor of one man even when run intermittently, and require but little care to keep in order. The finer seive is used as a dry Sifter and Mixer, the coarser one as a Mixer after the material is wet down. Yours truly,

S. J. MEEKER.

GOULD & EBERHARDT, NEWARK, N. J.

PITTS ✱ BURG.

Draw a Circle

WITH a radius of 300 miles around the city of Pittsburg and you have within this space the cream of the manufacturing interests of the United States. Our location may in part explain why we are able to serve our patrons (east, west, north and south) with more than usual promptness. Low freight rates and quick service have helped to make Pittsburg the prominent distributing center it is. If you appreciate these items, correspond with us when in need of foundry supplies. You can get anything wanted at the Foundry Supply Depot of

J. S. McCormick Co.

We will make our Prices satisfactory.

PITTSBURG, PA.

FOUNDRY MOLDING MACHINES,
STRIPPING PLATE MACHINES,
PORTABLE, AIR-POWER, MACHINES,

USING WOOD OR METAL SPLIT PATTERNS, WITHOUT STRIPPING PLATES.

Write for information.

The Tabor M'f'g Co.,

ELIZABETH, N. J.

ESTABLISHED 1875.

STOW MANUF'G CO.,

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INVENTORS OF THE

FLEXIBLE SHAFT

FOR ALL PURPOSES.

The oldest and largest manufacturers in the world

PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

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Over 10,000 in Use.

ALWAYS READY!

800 TO 2000 CANDLE POWER.

ESPECIALLY ADAPTED FOR

FOUNDRIES

PORTABLE, SELF-CONTAINED, AUTOMATIC.

NO SMOKE! NO SPRAY! NO SHARP SHADOWS!

Now in Valuable Use With Hundreds of Foundries

In addition to 400 Railroads and over 500 Contractors.

ROSS-MEEHAN FOUNDRY CO. }
CHATTANOOGA, TENN., May 5, '90. }

The Wells Light M'f'g. Co., Nos. 44 and 46 Washington St., New York City:

GENTLEMEN—It is con rary to our rule to give testimonials, but an article with the merit of your Wells Light deserves to be made an exception. We have used your lights for the past five years, and consider them indispensable to us.

Yours very truly,
ROSS-MEEHAN FOUNDRY CO.
P. A. BRAWNER, JR., Sec'y. & Treas.

REQUEST CIRCULARS FROM

THE WELLS LIGHT M'F'G. CO.

EDWARD ROBINSON, Sole Proprietor.

44-46 WASHINGTON STREET, NEW YORK.

Molders!

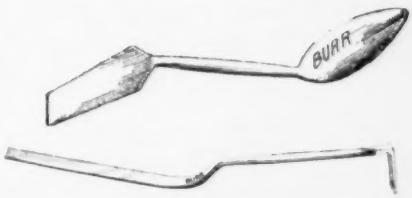
Has the New Year brought prosperity to you? We hope so . . .

It certainly has to us, as our orders for Molders' Tools this month up to and including to-day (January 20th), amount to 2,693 tools. . . . . .

The orders came from all parts of United States and Canada, also one from Vienna, Austria, which shows the world wide

reputation our tools have, and they deserve it, as there is no question about them being the best tempered and finest finished

Molders' Tools in the world to-day. Are you one of the fortunate users? If not, why not? All first class Foundry Supply Houses and Hardware Stores sell them . . . . . .



So do we when your dealer does not carry them. Write for Illustrated Price List to . . . . . .

Burr's Damascus Tool Works,

Largest Manufacturers of Molders' Tools in the World.

66-72 Fort Street East, DETROIT, MICH.

Discouraged!

The man who started in to wash postage stamps so that he could use them again, says that the Government doesn't do a thing to encourage cleanliness and economy.

And the man who is engaged in "manufacturing" Plumbago . . . would be equally discouraged if foundrymen understood just what that means.

As a matter of fact, the real, dyed-in-the-wool Plumbago isn't manufactured, any more than blue sky or red sandstone is manufactured. Plumbago is made in the foundries of Nature, and she has a monopoly on the business. She has a large plant somewhere down by Ceylon's coral strand, and she makes the only Black Lead you or any other foundryman ought to use. I buy this in carload lots, in bond, so that there can be no question about it being Nature's own unassisted product. I can sell this Plumbago at a low price and get a fair profit. That is all I want. Some manufacturers think they can make more by assisting Nature. They will find a large, aggressive moral in the story of the man who laundered postage stamps. What I say about Plumbago is true so far as my other Facings are concerned—no adulteration. They are labor savers—that means money savers as well.

It is true about my **Supplies,** Riddles, Brushes, etc. I don't try to make tampico—another name for grass—take the place of bristles. (It costs you two cents postage to get together on this subject.)

F. B. Stevens "Everything for a Foundry." Cor. Griswold and Atwater Sts. **DETROIT, MICHIGAN.**